THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. MAY 24, 1894. CHICAGO, ILL. NUMBER 21.

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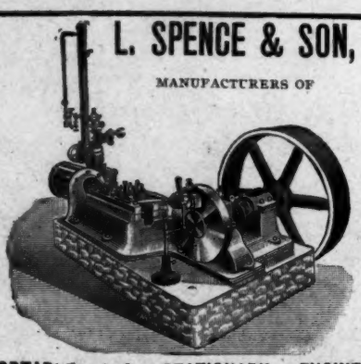

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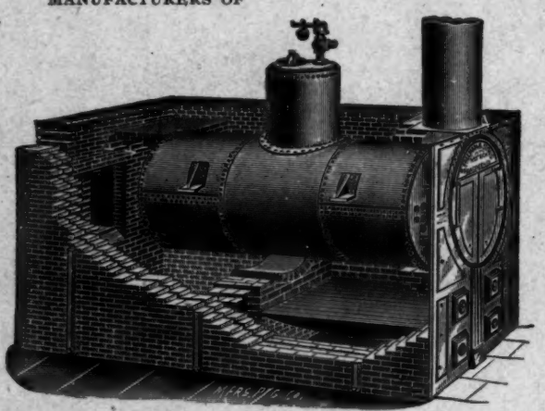

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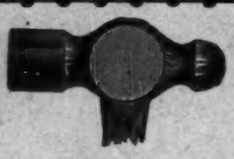

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THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. MAY 24, 1894. CHICAGO, ILL. NUMBER 21.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

Higher prices in every department of the market is the concensus of the week's reports from iron and steel selling centers. The conviction has deepened, moreover, that the wretchedly low prices of the early months of 1894 will not return, even when the buoying influence of the fuel famine is gone. That iron ore has touched its lowest point is recognized by sellers and furnacemen alike. That the action of the Senate on the ore tariff has strengthened this belief is evidenced by the fact that a transaction of upwards of 100,000 tons of hard non-Bessemers for Eastern delivery, that had been hanging fire, was closed on the day following the Senate vote. The scarcity of fuel is now severely felt even by the largest Pittsburg producer, its accumulated store of coke having dwindled to small proportions. The Chicago district furnaces are still unaffected, but they are the only important group of coke stacks to escape. The Edgar Thomson furnaces are only about half effective, and one Northern Ohio and one Shenango Valley furnace are all the coke stacks that are active in the Western Pennsylvania, West Virginia and Ohio districts, leaving out those in Pittsburg and vicinity. More mills have been compelled to close in the week for lack of coal, and those having natural gas find orders increasing. But the paralysis of the fuel trouble has affected consumption as well as production, and there is not the rush for some kinds of material that might be expected. Better prices are being secured, and high fuel cost makes advances imperative. A Pittsburg mill that has paid 3½c. a bushel for coal was compelled to give 14c. a bushel for enough to finish a contract. Bessemer pig has reached $13.50 at Pittsburg, and Pittsburg brokers have ransacked the country for stray lots, bringing by rail one lot of 2,000 tons, that has been in litigation, from the Minnesota Blast Furnace Co.'s yard, at Duluth. The price is reported to be $13, delivered. Troy, N. Y., has also contributed to Pittsburg, about 10,000 tons being picked up there. Billets, obtainable only in small quantities have sold at $18.50, Pittsburg. Finished material, both East and West, has been sold for the most part in small lots, and at an advance of $2 to $3 a ton for plates and beams and channels. Here and there a soft spot shows itself, however, and one plate contract in the Central West brought out a price lower than 1.15c., Pittsburg, for tank plate, though mills claim that 1.20c. is bottom and some are firmly maintaining a minimum of 1.25c. Eastern mills are well employed on small quick delivery orders, but the higher prices asked and the fact that deliveries cannot be guaranteed keeps back large business. Steel billets in Philadelphia are nominally $19.50. Southern selling points report a scarcity of some grades of Southern iron and quotations are advanced 25 cents on these, but late sales have been made at Northern points on a basis of $6 at furnace for gray forge and $6.75 for No. 2 foundry. The promised advance of freight rates has evidently stimulated buying of Southern iron to some extent. Northern makers of foundry iron have put up their quotations from 25c. to 50c. a ton and some of them have refused offers shading the new figures. The sharp cuts in Western rates on iron and steel, noted two weeks ago, have been all too short-lived, and the former figures are to be restored May 26 by most lines, while one has made the date May 29.

THE CLEVELAND OUTLOOK.

A sale of 100,000 tons of hard non-Bessemer ores to an Eastern firm in the past week is an encouraging piece of news from a neglected side of the ore market. It is known that a number of inquiries for ore have been made of late, and a buying movement of considerable volume may be looked for within the next fortnight, particularly if the expected happens in the coke regions, and the list of active ovens goes on increasing. The moderate volume of ore transactions that have been closed from week to week of late have been on the basis of the early sales and efforts by furnacemen to shade these figures have been unsuccessful. It is conceded that ore prices have come to a stand, and sellers are more confident in expressing the belief that advances will be secured before the season is over. The fact that fully 25 per cent. of lake tonnage is tied up has kept rates at the figures prevailing one week ago.

Pig Iron. The hunt for Bessemer iron to keep Pittsburg steel works in operation has abated, as far as the valleys are concerned, because the supply is exhausted. A sale of 1,000 tons of Bessemer is reported at $12.50, Cleveland, which means $13.65 delivered at Pittsburg. The sales in the Pittsburg district have been at $13.50, but the business done is not large. The Bessemer famine is accented by further withdrawals of Pittsburg district furnaces from the producing list, the Braddock group being less than half active. Further sales of Bessemer are reported for delivery in June, July and August at $11 at furnace. Producers of strong foundry irons have advanced quotations 25 and 50 cents, and $11.25 and $10.25 at valley furnace are asked for No. 1 and No. 2, respectively. One furnace firm quotes $11.50 and $10.50. Some sales have been made at an advance of 25 cents above prices ruling two weeks ago, and sellers are all firmer in their ideas. Between 2,000 and 3,000 tons of Southern iron was sold in Cleveland, the past week, at $9.75 for No. 2 foundry and $9 for gray forge.

Finished Material. The advance in mill products has extended to bar iron and sales have been made the past week at 1.10c. at mill in car lots. Stocks are being reduced and what little coal the mills which depend upon that fuel can get, is expensive. The advance in structural steel is more than maintained and 1.30c to 1.40c is the range of quotations on beams and channels; angles sell at 1.25c and tank plates are 1.20c to 1.30c. Contracts of any size show that the mills are not equally firm, and it is not many days back that a Northern Ohio plate order of several hundred tons was taken at a price shading 1.15c at mill. A structural material contract for 700 tons at Toledo and one for material for the telephone building in Cleveland are to be given out this week. The mills are generally behind on contracts and the fuel trouble is cutting off production every day.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

No serious trouble has as yet come up because of a shortage of fuel, the only apparent effect being that manufacturers are rather inclined to shorten their other purchases to fit the amount of fuel they can get. Prices are again a little higher on some classes of steel, but pig iron, while firm, is no higher. Sales of crude material have been a little smaller in the past week than the week before, and of finished material about the same. It is probable that the partial resumption of operations in the coke regions will start a little spurt in buying, especially in raw material.

PIG IRON.—Southern coke iron has had a little better sale in the past week than in the week before, several orders of 200 and 300 tons being reported and one of 500 tons. Local iron, however, has not done as well as in the week previous. One order of 1,000 tons is reported, and quite a good lot of small orders, but the total tonnage was not large. In Lake Superior charcoal iron one order of 100 tons was taken, but aside from this no sales were made except of a few car loads. The outlook for the immediate future is not especially good, but it is expected that there will be some fairly good sales this week, and that when the labor troubles are settled there will be considerably more buying.

BARS.—Several orders of 150 and 200 tons of iron were closed in the past week, and the outlook for future business is very good. Prices are made now at 1.10c to 1.15c, the lower quotations being given only on large lots and exceptionally good specifications. In steel, while the inquiry is quite active, very few sales have been made, because the mills are not anxious for business owing to the unsettled state of the billet market. Steel rods from billet stock are now quoted all the way from 1.25c to 1.40c, while steel scrap stock carries the same quotations as iron.

STRUCTURAL MATERIAL.—The only large business closed was the contract for an office building requiring several hundred tons. Small order are quite frequent, particularly from the country, where building is much more active than in the city. Quotations are as last reported. Beams and channels, 1.40c to 1.45c; angles, 1.40c to 1.45c; plates, 1.45c to 1.50c; tees, 1.70c to 1.75c. Quotations from stock are .10c to .15c higher.

RAILS AND TRACK SUPPLIES.—A fair number of small orders have been closed in the past week, and there are quite a number of inquiries in the market, which will be closed in a short time. Prices are unchanged. Rails, $25 to $27; splice bars, 1.40c; track bolts, 2.30c to 2.40c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—The local mills have only about 2,000 tons of rods and 1,000 tons of billets for June delivery and the demand is very largely in excess of this. Some fairly good sales of billets were made in the past week at $19 to $19.50. Rods are still quoted at $26.50. It is probable that during June sales enough of both billets and rods can be made to run the local mills for a good part of the balance of the year.

PLATES.—Inquiries have kept up well, and sales of quite good amounts have been made in the past week. Prices are still made as follows: Tank steel, 1.35c to 1.40c; flange steel, 1.65c to 1.75c; fire box steel, 3.75c to 4c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—The demand is small, except that one or two season's contracts are coming up. Prices are unchanged. Open hearth spring, machinery and tire, 1.85c to 1.90c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

SHEETS.—There is a better demand for black sheets, and good sales are reported on a basis of 2.35c to 2.40c for No. 27 common. Galvanized iron sheets have also been having a better inquiry, and quotations have stiffened to 75 and 15 per cent. discount.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The effect of the coal strike is more marked this week in causing suspensions at iron and steel mills. Orders have been given for the shutting down of all departments of Shoenberger & Co.'s mills, this following upon several days of shortened operations. Notice had been given the preceding week to billet customers that they could no longer be supplied. Wire works at Braddock and Rankin have stopped, and the Duquesne forge at Rankin is idle. Four of the Carnegie Steel Co.'s furnaces at Braddock are banked. In many plants the light fuel supply, which is obtained by hook or crook, is compelling a partial shut-down. Thus the demand for Bessemer iron is not what it was ten days ago. The little that buyers have found has brought $13.50 in the past week. Forward contracts for Bessemer running into the Fall continue to be made at $11.60, and upwards of 30,000 tons have been taken on this basis. Mill and foundry irons are in somewhat better demand, and in sympathy with Bessemer, foundry iron has advanced from 25 to 50 cents a ton. Steel billets are not quotable, as transactions have practically stopped. Small lots have sold at $18.25 and $18.50. Finished material is distinctly firmer, and an advance is asked. On beams and channels, 1.25c, Pittsburg, is the minimum. It is generally conceded that the lowest prices for the year have been touched, and that a firmer market may reasonably be looked for even after the fuel strike ends. Wire rods show an advance of 50 cents; wire nails are 10c. a keg higher. In the coke regions operations are spasmodic, and while the operators have gained at several points there are smaller forces at other plants. The past week has shown an average of about 2,000 ovens active, which, in the uneven way they have been operated, would mean an output of 16,000 tons. In some cases furnace firms with stocks of coke too small to count in furnace operations, have turned a good margin in selling it to steel works and foundries.

Cincinnati. The increasing scarcity of standard grades of iron is a marked feature in the situation, as is also the continuation of slack demand from consumers. A great deal of telegraphing is done to hurry forward delayed shipments, and in more than one instance foundries have been compelled to close down for lack of such iron as they require to maintain mixtures. The scarcity is most noticeable in soft grades. At the same time, the supply of No. 3 foundry and grey forge is very limited. Among the Northern irons the most urgent demand is for spot Bessemer, which appears to have been all cleaned up. Northern furnaces are selling better in the absence of supply from the South. Northern mill irons continue very dull. Scrap iron is reported in somewhat better demand. Looking over the whole field, as to consumption, it is safe to say that there is a little improvement.

Philadelphia The miners' strike in the South has caused some of the leading iron producers to bank their furnaces. Many foundrymen who have always limited themselves to certain brands now find that they have to experiment with new brands, and consequently they are having trouble with their mixture. It is strange that prices do not take a sharp upward turn in view of rapid reduction in stocks, higher fuel and higher freights.

THE IRON TRADE REVIEW

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IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY
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ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER.

MAY 24, 1894.

A SIGNIFICANT ORE SALE.

An iron ore sale of unusual significance has been made within the past week. A transaction involving upwards of 100,000 tons of hard non-Bessemer ore was closed on Tuesday, and the fact that calls for special mention is that the Eastern furnaceman who bought had been postponing his purchases to see what the Senate would do about the duty on ore. The fact that but one Democratic Senator voted against the 40-cent duty, is evidence that the main features of the Senate bill, particularly those which the minority of the dominant party have forced their associates to incorporate, are to be put through according to program. While it is to be considered that all these changes have yet to run the gauntlet of a conference committee and then of the House, it is well known that the Senators who compelled the changing of several hundred items will not allow a bill to pass finally, that is stripped of that which their unflinching attitude has put into it.

The Eastern buyer of ore referred to above has been in the position of many another manufacturer and business man—waiting until assured that the bear influences so long upon the market had spent themselves. There is no estimating the volume of business that is in suspense because would-be buyers cannot assure themselves as to the duties to be expected on the commodities in which they are interested. Some, becoming satisfied, as in the case cited, that prices will not be lower, have gone in, in anticipation of conference committee results.

ARMOR PLATE ROMANCING.

It should be noted that the latest investigation of Carnegie armor plate is based on information about transactions before the great strike, now suddenly available when it has been demonstrated that such revelations have a market value. Burgess McLuckie and other leaders of the strike of two years ago would have fired their ammunition earlier, one would think, had there been any power in it to harm the Carnegie Steel Co. The informers have had their memories freshened, moreover, on other points, and have testified, according to a press dispatch, that the structural steel used in the construction of vessels had imperfections that were covered up with putty, soap and steel varnish. Charges of this sort are subject to large discounts for animus and irresponsibility. Nor will there be any disposition to give hasty credence to another class of charges thrown out in the form of newspaper insinuations that the Carnegie Steel Co. has had an arrangement with manufacturers of projectiles, by which shot of special inferior kinds were furnished for testing Carnegie plates. Since the life of the projectile industry depends upon the ability of the projectile makers to penetrate armor plates, it is hard to believe them foolish enough to "arrange" for their own injury. Turn the proposition about, and will any of the armor plate scandal-mongers soberly invite the public to believe a story to the effect that the Carnegie Steel Co. has "arranged" with the Carpenter Steel Co. to allow the latter's projectiles to go through its plates, and thus secure their rejection?

Or, take an actual case. Is it supposable that the Bethlehem Iron Co. deliberately furnished inferior plate for the test of last Saturday, when a 12 inch Carpenter armor-piercing projectile badly shattered an 18-inch Harveyized side-armor plate intended for the new battle ship Indiana?

Moreover, the testimony of the inventor of the Carpenter projectile ought to count for something in this connection. Collusion between plate and projectile manufacturer, says Mr. Carpenter, is impossible. Leaving out the question of opposite interests and the rigidity of Government regulation, he cites the hardening process as alone sufficient to disprove any such charge. This is accomplished by special appliances so severe on the steel that should there be the least tendency to brittleness the projectile would fly to pieces while hardening. It would thus be impossible for a projectile of brittle steel to be furnished the Government.

But we can safely trust the investigators now at work to give us the truth about it all. There has been an overabundance of romancing, we are convinced, and it would be entirely the orderly thing for the sensationalists to subside for a time and allow the public to wait in patience for a little cold truth.

THE CZAR OF THE COAL WORLD.

We fancy that the historian of the future, who sees the present disturbance in its right perspective, will comment with far less complacence than is shown to-day in view of conditions reflected in this Columbus telegram of May 21:

> President John McBride has granted the request of one mine in Illinois to dig 40 carloads of coal for use by the State Insane Asylum, whose superintendent wrote that they were entirely out. Permission was also granted to dig sufficient coal at Carbon Hill to run the pumps supplying water to put out a fire in a mine at that place.

And if the people of a town whose water supply was cut off, because there was no longer coal to make steam, were in imminent danger from fire, it would be necessary, we presume, to consult Mr. McBride before a pound of coal could be dug. Mr. McBride has come to be very much of a czar. We do not remember that any man before him has enjoyed the peculiar distinction of having his permission asked, across three States, before the means could be furnished the owners of a valuable property, to save it from destruction. Generals who have put districts under martial law, in time of war, have for a little time wielded authority well-nigh absolute, but Mr. McBride is unique in his position of dictator in time of peace.

But the power that is lodged in one man's hands to block commerce, to paralyze industry and to bring discomfort and loss upon thousands who are altogether apart from the contention, is not the only surprising feature of this struggle. When the Cleveland conference adjourned,

after spending two or three days in a fruitless attempt to get miners and operators together, the operators were astonished to hear from the officers of the miners' union that in no event could the conference have had any outcome. Session after session had been had, under the impression that each side was fairly trying to facilitate agreement, when at last President McBride informed the owners that the whole thing was a farce; that the miners would not consider a settlement with the operators who attended, because the latter had not brought to the meeting other operators who, it was known from the beginning would not take part. And in the face of this, the operators were beset with newspaper editorials urging them to agree with their men and end the strike! We are not surprised that the patience of the fair-minded operators is exhausted. Because they cannot control and bring to their way of thinking, their unfair competitors who are responsible for the deplorable conditions preceding the strike, they must keep their mines closed even though they may be willing to grant everything asked of them. Meantime the fact that West Virginia mines are running and are getting famine prices for their coal is sufficient answer to the argument of the Miners' Union that a national strike must be settled on a national basis. The strike is not national.

The operators' meeting in Pittsburg, on Monday, ended in a decision by the railroad operators present to offer iheir men 65 cents. This would correspond to 56 cents in Ohio. If the offer is rejected, as it doubtless will be, there is a probability of non-union operation, and a further introduction of machinery in the mines. It need not be expected that the McBride method will long be tolerated when the discomforts and losses of the strike have extended from manufacturing establishments to individual consumers who, thus far, have not taken pains to acquaint themselves closely with the facts. Public sentiment, that generally inclines to the employes' side in a strike, jumps to the conclusion that there is a just demand for better wages on the one side, and a refusal to pay more, on the other. President McBride's attitude has raised a very different issue, and one on which we do not believe the miners can win or ought to win.

THE line between furnace and foundry coke is not clearly drawn now-a-days. Coke is coke, whether it was 48 hours in the ovens or whether it had the advantage of the extra 24 hours on Sunday. Furnacemen in some instances have been able to turn a tidy sum by disposing of the stock they had on hand, which while cutting a small figure in furnace operation would reach quite a distance distributed among foundries. With foundrymen paying $3.50 for coke on board cars in the Connellsville region, the possibilitles of profit to holders of coke are particularly attractive.

THERE were buyers who wrote sundry letters last fall and winter asking for concessions on contracts, as the market steadily dropped, and selling firms had no end of trouble keeping in line customers of this sort, who were in no mood to hear lectures on the sacredness of contracts. Some of these little episodes are so fresh in mind as to suggest that sellers are in position now to turn the tables and ask an advance on contract material. Strangely enough, though, this is a rule that doesn't work both ways.

THAT a tariff bill will be passed by the present Congress is now almost a certainty. The necessity of acting seems at last to have been impressed upon the leaders, and there is now little disposition on either hand to delay the issue. Under the guise of a tariff for revenue, the friends of protection will receive far more important concessions than they had any cause to expect when Congress met in December. It is folly to indulge in partisan quibbles about names, while there is any disposition on the part of the majority to abate its campaign of destruction. Nor is it profitable to question motives. It is the duty of Protectionists, under the circumstances, to have all eyes on the main chance.

AMONG THE IRON MINES.

Last week's ore shipments from Ashland were 53,057 tons from the Northwestern docks and 24,008 tons from the Wisconsin Central.

The Pewabic has about 400 men on its roll, including the Keel Ridge force. . . . The Millie is sending out its stockpile, which contained about 13,000 tons of ore when shipping began. No mining is being done. . . . The loading of ore by steam shovel goes briskly on at the Pewabic, and the stockpiles which still contain fully 75,000 tons will rapidly disappear. . . . The Commonwealth Iron Co. is shipping a few cars of ore per day from its Badger mine, but nothing is going out from stockpiles which, at its various properties must aggregate 100,000 tons. . . . The Penn Iron Mfg. Co. is shipping from mine and stock about 10,000 tons of ore a week. The working force has been gradually reduced, until the number is about 375. Work at the East Vulcan will probably be finished up this week.—[Norway Current.

Two Harbor shipments in the week ending May 17 were 54,553 tons, of which 38,028 tons were from the Vermilion range and 16, 545 tons from the Franklin and Canton mines. Season shipments have been 171,853 tons, as follows: Minnesota, 52,027; Chandler, 65,853; Canton, 39,238; Franklin, 14,735.

The Duluth mine on the Mesabi, operated by the Duluth Ore Co. is now a Consolidated property, the Rockefeller interest having recently acquired the lease.

Six train loads of ore per day are now being shipped from the Canton. The trains consist of 25 cars each, and about 20 tons to the car. Caving has been commenced on the north line of the property. In some places the earth falls easily while in others it is necessary to use powder to bring it down. It is now possible to stand at the edge of one of these caves and see the men working beneath the ground.—[Mesabi Range.

A Much Disputed Pipe Contract.

The city of Cleveland, after being balked by the courts in its attempt to buy second-hand water pipe from Clow & Son, of Chicago, advertised again for bids, and these were opened May 17. The following were the figures: The Anniston Pipe & Foundry Co., of Anniston, Ala., 3 inches to 48 inches, $18.10 per ton; Lake Shore Foundry Co., Cleveland, 3-inch pipe, $18.50, 4-inch, $18.25, 6-inch, $18.00, 8-inch to 48-inch, $17.95; Howard-Harrison Iron Co., Bessemer, Ala., 3 to 48-inch, with the exception of 20-inch, $18.10; Clow & Son, of Chicago, 6-inch, $16.50, 8-inch, $16.50, 12-inch, $14.75, 24-inch to 36-inch, $14.75. Clow & Son's pipe is that which was used in the World's Fair grounds at Chicago. The city board of control divided the contract between the Lake Shore Foundry Co. and Clow & Son. The representative of the Anniston Pipe & Foundry Co. makes the point that the fact of his company bidding brought down the figure of the Lake Shore Foundry Co., which was $20.40 at the original letting, and he regards it unjust that the city should give Clow & Son any part of the contract. He added: "Here we are shut out by the city accepting a lot of old second-hand pipe that is only fit for the scrap pile. I have been in the pipe business since 1857, and I know that pipe once laid in the ground and taken up is no good. In retarring it the tar does not enter the pores of the iron, and when relaid it soon becomes leaky and worthless." Out of the total of $63,115.50, which the city is to expend for pipe in the coming year, Clow & Son were awarded all but $13,039.75, which went to the Lake Shore Foundry Co.

TIN plate mills are all making large outputs.

SIGNIFICANT TARIFF ACTION.

Eight paragraphs of the metal schedule were disposed of in the Senate on Tuesday, and the remarkable feature of the day's work was the introduction by Senator Jones, plainly with the endorsement of the compromisers, of an amendment giving a higher rate than that proposed in the compromise bill, on round iron in coils, and on bars, blooms and slabs not specially provided for. The substitute was exactly the McKinley bill classification, and substituted specific rates instead of ad valorem, though at lower figures than provided in the McKinley act. Senator Hale, of Maine, taunted the majority because they proposed an amendment patterned after the McKinley bill and Senator Sherman, who had not been advised of the change, asked that it go over for a day. This angered Senator Jones and he withdrew the amendment. Senator Quay who has been exceedingly alert to Pennsylvania's interests, and who seems to have been advised of Senator Jones' intention to introduce the amendment, came to the rescue, and re-introduced it after its withdrawal. It was then promptly passed. The episode is significant of the fact that Republican Senators like Quay, Cameron and Cullom, who have been discreet enough to refrain from nagging partisan criticism and exposure of the inconsistencies of their opponents are best able to get concessions for the interests they especially represent. The amendment referred to above makes the following provisions:

"Round iron in coils or rods less than 7-16 of an inch in diameter, and bars or shapes of rolled iron not especially provided for in this act, 8-10 cent per pound [McKinley act, 1 1-10c.], provided that all iron in slabs, blooms, loops or other forms less finished than iron in bars and more advanced than pig iron, except castings, shall be subject to a duty of 5-10c. [McKinley act, 8-10c.] per pound; provided, further, that all iron bars, blooms or sizes or shapes of any kind, in the manufacture of which charcoal is used as fuel, shall be subject to a duty of $12 [McKinley act, $22] per ton.

The most important action was that fixing a duty of 40 cents a ton on iron ore. This was practically unanimous. An amendment to raise the duty to 60 cents was laid on the table 32 to 21. Senator Hill and three Populists voted to put iron ore on the free list. Other rates fixed were as follows: Pig iron, scrap iron, etc., $4 per ton [McKinley act $6.72]; beams, girders and other structural iron or steel, six-tenths of 1 cent per pound [McKinley act 9-10c.]; boiler plate, from 5-10c. to 25 per cent ad valorem [McKinley act 5-10c. to 45 per cent.]; forgings of iron or steel, 1½ cents [McKinley act 2 3-10c.]; hoop or band iron or steel (cotton ties), 30 per cent. ad valorem [McKinley act 1c. to 1 3-10c.] Bar iron, 5-10 [McKinley act 8-10c.]; round iron, 6-10c. [McKinley act 9-10c.]; flats less than one inch wide 6-10c. [McKinley act 1c.]

A sensation was created in the Senate Wednesday by the speech of Senator Gorman stating that the Democratic party would pass a tariff bill; that it was found that the bill first presented to the Senate could not pass; that a bill, the compromise, had been constructed on the Democratic principle of a tariff for revenue with incidental protection and that this bill would pass and be signed by the President. A motion was made by Senator Teller to lay the bill on the table—this was sensation No. 2. It was lost, 28 to 38, Republicans voting aye and Democrats and Populists voting nay.

Amalgamated Scale Completed.

It is the expectation of the officers of the Amalgamated Association that the convention now in session in Cleveland will reach adjournment Saturday night. The scale was completed on Wednesday and the convention then began consideration of the proposed changes in the constitution. Prominent among these is a provision giving the officers larger discretion in the settlement of wage questions coming up between conventions. Another is the proposed change from an annual scale to a perpetual scale with 60 days notice of the desire of manufacturers or employes to terminate it. There is not a little opposition among the men to the 60-day proviso, which has been asked for by Mahoning Valley manufacturers.

The scale will be put in type within a week or ten days and will be sent to the manufacturers' committee at Pittsburg. No appointment has been made, as yet, for conference. While no official statement has been made by the officers, the usual policy of secrecy being followed, it may be said that very few changes are made in the scale as modified in the two conferences between men and manufacturers, held since the conference of last summer. The boiling rate is kept at $4, based on a 1½ cent card for bar iron. In the fifth clause of the memorandum of agreement, which reads, "Mills may work three turns in 24 hours when practicable, except boiling department," the last three words were stricken out, permitting three turns in puddle mills where practicable. For rolling and heating on bar and nail plate mills the rate is left at 56 7-10c. per ton of 2240 pounds, with 1.2c. increase for each of the first two advances of 1-10c. above 1½c. for bar iron, and 1.3c. increase for each of the next three advances of 1-10c. for bar iron, making the rate 63c. on a 2-cent card.

The published statement that some reductions were made in the sheet mill scale is incorrect.

On the Editorial Table.

We have received from the Garden City Sand Co., of Chicago, their latest catalogue, which is an excellent specimen of the printer's art. It is in booklet form, and printed on highly calendered paper, and illustrated in half tones. The illustrations show the works at which the Kentucky fire brick sold by the Garden City Sand Co. are made; various forms of fire brick for different purposes, such as blast furnace, heating and puddling furnace, cupola lining, boiler setting, smoke stack lining, etc.; the Blakeney cupola, for which the company are agents; crucibles for melting brass, copper, gold, steel and other metals, and their extensive sand banks. The catalogue contains, besides, a list of the various supplies for the foundry, furnace and various purposes that they handle, and a considerable amount of valuable miscellaneous information. The catalogue may be obtained by addressing the Garden City Sand Co., 1009-1010 Security Bldg., Chicago.

"What Congress Has Done" is the title of a vest pocket booklet of 16 pages and paper cover, by Jacob Reese, of Philadelphia. The front cover page bears the title of the work and the outside back cover page carries the legend in bold type, "It has placed the odorless phosphate on the free list." Between these covers the 16 pages are in their original clear white, innocent of printer's ink. Mr. Reese's treatment of the subject leaves little to criticize, except that his history is one sentence too long.

The Weston Engine Co., of Painted Post, N. Y., have just issued a catalogue descriptive of their automatic engine, of which illustrations have appeared in this paper. Both in the design of the embossed cover and in the clearness of illustration and type, the work is a model. The parts of the engine are well described, and the illustrations are full and luminous. A table of dimensions is given; also of foundations with and without sub-base, and a table of Weston engine constants.

Status of the Coke Strike.

Reports from the Connellsville region indicate that the strikers are steadily losing ground. In the past week the Rainey plants, as has been the case since the strike began, have shown the greatest activity. It is stated at the office of W. J. Rainey, of Cleveland, that about 1,500 ovens are going, and that none of the Rainey plants are now inactive. Uniontown advices of May 22 say that there were serious breaks in the lines of the strikers on that day, many of the Frick men in particular returning to work. It is estimated that in the entire region about 2,000 ovens are in blast. The Connellsville *Courier's* detailed statement of operations in the week ending May 12 showed 1,486 active and 16,047 idle ovens, with an estimated production of 11,989 tons, a decrease of 6,186 tons from the preceding week. In the first three months of this year the number of active ovens averaged about 9,500. The shipments in the week ending May 12 were 529 cars. Foundry coke has been selling the past week at $3.50 at the ovens, and, it need not be said, is difficult to get at that price. Operations at the Rainey plants have been maintained under heavy guards of armed deputies.

THE striking employes at the National Tube Works, at McKeesport, Pa., held a meeting May 22, and decided to stay out all summer if the 20 per cent. increase asked for is withheld that long. The company states that it will close the mill entirely for the present, and send its contract work elsewhere.

BROWN CANTILEVER CRANE FOR SHIPYARDS.

Mr. Alex. E. Brown, general manager of the Brown Hoisting & Conveying Machine Co., read a paper at the last meeting of the Civil Engineers' Club, of Cleveland, with the title, "Some of the Requirements of the Design and the Results of the Tests of a New High Speed Electric Cantilever Crane for Shipbuilding." With the help of diagrams and photographs, the speaker gave details of the construction and operation of a recent extension of the material handling plant which his company had installed for the Newport News Ship Building & Dry Dock Co., at the latter's yard, at Newport News. A high trestle is erected between each pair of ship ways. Upon a track on the top of this trestle is mounted one of the Brown Hoisting & Conveying Co.'s patent balanced cantilever cranes. The trestle and crane bring the horizontal boom of the crane high enough above the shipways to pass over the highest point of the ships being built. The arms of this cantilever project entirely over the full width of the ships on either side of the trestle. By means of trolley and hoist-block mounted on the cantilever of the crane, the load can be hoisted from the ground and traversed from one end of the cantilever to the other, as the pier or base of the crane is arranged so that the load passes through it. As the crane travels up and down the trestle on which it is mounted, by its own power, the entire length and width of both ships are covered by the extent of the motions of the crane, and materials can be handled and delivered to any part of the ships being built.

There is also a yard crane, which takes materials from the tracks running through the yards. It either places the plates in crates or racks built for them in the yard, ready to be used at any time in the shop, or takes the finished plates from the shops on either side of the track on which it runs and delivers them to the end of the ship crane trestle. Here, as they are needed, they are picked up by the cantilever ship crane and lowered and held in position until bolted to the frames of the ship. The cantilever crane serving the first two 5,000-ton ships built at Newport News placed 750 feet of plate girders on the ways in 4½ hours. This was considered very rapid work at that time, the speed of 150 to 200 feet a minute, of the crane on the trestle, being all that could be utilized. Illustrating the rapid work done under this system, the statement was made that at a launch the guests went in to a banquet at the offices of the company. When they had finished they went again to the shipyard, and to their astonishment saw the keels of two other boats already laid to receive the frame.

But the company's idea of speeds and capacities increased in proportion to the increased output of work with the cantilever crane, over the old system. They wanted a new crane with an average traveling speed along the 750-foot trestle, on which it was to run, of 600 feet per minute, with its full load of 12½ tons 55 feet out on the cantilever of the crane, or, with 9,000 to 10,000 pounds out at the extreme end of the cantilever, which was to be 90 feet each side of the center. The distance from the ground to the cantilever of the crane was to be an average of 97 feet. Complying with these requirements, a new crane was built which Mr. Brown described in detail.

All of the speeds of hoisting and lowering, it can be seen, must necessarily be very rapid, to allow the crane to handle material for two ships under construction at the same time, and to be economical by not keeping the men waiting for material. Steam was the motive power in the first ship cranes installed at this plant, but it was decided to make the new one an electric crane. One of the difficult problems to be solved was to get a motor of sufficient power and at the same time of such construction that it would handle the widely varying loads that were required to be handled at varying speeds in proportion to these loads. It was found that a single powerful motor must be used for all the motions and power of the crane, and that it must be a substitute for the engines that it replaced. On account of the heavy changes of current and the sudden variations of load constantly occurring, it was considered impracticable to allow the motions of the motor to be reversed, and friction clutches were determined upon to control all the motions of the machinery. A Short gearless motor, run at 110 revolutions for 20 to 25 h. p. was constructed and wound so that running at 387 revolutions it would develop 75 to 77 h. p. with 360 amperes of current and 220 volts. A slow speed motor was a necessity, because, if it started with its full maximum power at a comparatively small number of revolutions, it could lift the light load with the same horse power but with a correspondingly greater or double the number of revolutions; whereas a high speed motor, if started at a high speed suitable for heavy loads, would not lift a lighter load at any greater speed.

After going at length into the details of the electrical construction the speaker came to the results achieved in actual tests: The crane started from a rest with 460 to 480 amperes of current and as soon as it got under headway it ran down to 280 amperes, and, with the crane light running over the course, averaged 612 feet per minute, and over the center 300 feet, averaged 692 feet per minute, with about 300 amperes of current. With about 10,000 lbs. load at the end of the cantilever, the average speed over the course was 626 feet per minute and over the center 300 feet it was 750 feet per minute, with 280 amperes. With the load of 28,000 lbs. at 55 feet from the center the crane averaged over the whole course 610 feet per minute and over the center 300 feet, 690 feet per minute with 280 amperes. The average voltage was about 220. The speed of 750 feet per minute means 8½ miles an hour, and this speed obtained and absorbed again in the small limit of 564 feet. The efficiency in the hoisting and racking of the load and the traveling of the crane was about 70 per cent. Only one man is required to operate all the motions of the crane but an assistant travels with it to handle and guide the plates on either side of the trestle, as they are needed, or to hook on the plates as they are placed on the platform of the pier.

The tests of this electric crane do not show as well in efficiency or economy of operating as the steam power cranes previously built, and the cost was $10,000 to $12,000 more than a steam crane of higher efficiency and equal capacity would cost. The electric crane was installed, however, on account of the greater security against fire, the desire to concentrate all steam power plants at one point instead of scattering it in small powers through the yard, and the convenience in applying power to portable tools to be used at the sites of the ships under construction.

Personal.

President A. J. Moxham and Vice President Tom L. Johnson, of the Johnson Co., have been at Lorain, O., within the week, on business connected with the establishment of their mammoth steel plant at that point.

Mr. A. R. Perry, for many years identified with the malleable iron business of the country, has recently accepted the position of traveling representative of the Dayton Malleable Iron Co., of Dayton, O.

W. H. Stearns, formerly connected with the Chicago & Northwestern Road, has been appointed mechanical engineer of the Buda Foundry & Mfg. Co., of Harvey, Ill.

Mr. C. A. Clarke, resident partner and manager of the Chicago store of Hill, Clarke & Co., 12-14 S. Canal st., has recently returned from a month's trip in Texas, and reports having done a very satisfactory business there.

S. H. Harrington, president of the Harrington & King Perforating Co., Chicago, has just returned home from a two months' trip through the Western mining districts and along the Pacific Coast, taking in the San Francisco exposition.

Edwin N. Ohl, manager of the Etna Iron Works, New Castle, Pa., was united in marriage to Miss Catherine Bower at the bride's home in New Castle, May 16.

Fred. L. Lehman, of Naylor & Co., has resigned as director of the Otis Steel Co., Cleveland. Mr. Lehman has just returned from Europe.

Mr. E. C. Pechin has returned to Cleveland from an extended stay in Alabama, during which he inspected the prominent furnace properties in the Birmingham district.

Mr. C. B. Holland, in whose hands is the management of the Otis Steel Co.'s business, in the interest of English stockholders, has arrived in Cleveland, and will remain through most of the year.

THE Robert Aitchison Perforated Metal Co., 510-269 Dearborn st., Chicago, have recently made quite a large shipment of their perforated metal to Mexico, to be used for milling purposes. They report that their foreign trade is increasing very rapidly.

MUNCIE, Ind., Iron & Steel Works are running full.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The annual meeting of the Western Foundrymen's Association was held on Wednesday evening, May 16th, at 702 Western Union Building, Chicago. Mr. J. M. Sweeney, vice-president, occupied the chair in the absence of the president, who was out of the city because of ill health.

Mr. F. W. Sargent read the following report of the president, Mr. Geo. M. Sargent:

PRESIDENT'S REPORT.

FRENCH LICK, IND., May 15, '94.

To the Members of the Western Foundrymen's Association.

GENTLEMEN:—Your President deems it proper to say a few words at this, the annual meeting of the Western Foundrymen's Association, as to its work in the past and prospects for the future. Having been elected in September of last year, he has not had the opportunity of becoming as well acquainted with the members as he could wish.

The report of your Secretary will acquaint you with what has been accomplished since the formation of the organization. Right here the President feels it his duty, and it is a pleasure, to speak of the work of your Secretary. In securing papers from well known, practical and educated men to be read at the meetings of the Association, treating on various subjects of great interest and profit to all foundrymen, looking over carefully reports of the proceedings of each meeting, and seeing that the same were properly distributed, he has been indefatigable. Your President does not hesitate to say that the bright prospects for the future of the Association are largely due to the efforts of your Secretary, seconded as they have been by the members of the Asssociation, a few of whom have ever shown great interest in the work, and have given evidence by their presence at the meetings, and by their work and speeches that they are heartily in accord with the idea of the Association.

Your President some time since asked one of the members of the Association to suggest a subject or subjects for future papers. He replied, "Iron, iron; you can never exhaust the subject." And your President fully agrees with him. Every foundryman can ask a multitude of questions, but how few can answer satisfactorily. The whole subject is full of interest to foundrymen, for "knowledge is power," especially in the manufacturing and working of iron. It seems to your President that the future of the Association is very bright, and he believes the papers to be read during the coming year, and the discussions which will follow will well repay every foundryman in the West who has a representative at every meeting.

Respectfully submitted,
GEO. M. SARGENT, President.

The President's report was accepted and placed on file.

The Treasurer, Mr. A. L. Patch, submitted the following report, which was accepted and ordered placed on file:

TREASURER'S REPORT.

STREATOR, ILL., May 16th, '94.

To the President and Members of the Western Foundrymen's Association.

GENTLEMEN:—I would respectfully submit the following report of the finances of the Association for the year ending with this meeting:

Receipts from initiation fees, dues and advertisements	$455.00
Expenditures for printing, stenographic work, Secretary's expense account, etc	448.14
Balance	$ 6.86

I have the following bills, approved by the Secretary, and unpaid for lack of funds:

Cleveland Printing & Publishing Co., Nov. 8th	$39.40
" " " " " Feb. 5th	22.25
" " " " " Mar. 12th	18.90
" " " " " Apr. 11th	.65
" " " " " Apr. 30th	41.29
J. Nellis Hansen, April 21	9.30
Total	$131.79

I find that we have due us from members for dues $140.00, and for advertising $20.00, making in all $160.000 due us from all sources, which will make our standing as follows:

Balance on hand	$ 6.86	
Due from all sources	160.00	
Total		$166.86
Total liabilities		131.79
Balance		$ 35.07

While I think we have done exceedingly well financially the past year, all things considered, still I think we should all make a mighty effort to collect in our dues and pay off our indebtedness, some of which is of long standing.

Respectfully submitted,
A. L. PATCH, Treasurer.

The report of the Secretary was then read, accepted and ordered placed on file. It is as follows:

SECRETARY'S REPORT.

CHICAGO, May 16, 1894.

To the President and Members of the Western Foundrymen's Association.

GENTLEMEN:—I have the honor to present my report as Secretary of the Association for the past year.

The first meeting of the Western Foundrymen's Association was held on Thursday, May 25th, 1893, in Chicago, in response to a call signed by several of the prominent foundrymen of the West.

At that meeting there were present representatives of firms from Milwaukee, Marquette, Toledo, Cleveland, Detroit, Madison, Streator, Racine, Akron, Youngstown and Chicago—twenty-three in all. A constitution and by-laws were adopted, officers elected and the Association put on a working basis.

A first set of officers was elected at this initial meeting as follows: President, Mr. C. A. Plamondon, Chicago; Vice President, Mr. Jno. M. Sweeney, Harvey, Ill.; Secretary, B. M. Gardner, Chicago; Treasurer, Mr. A. L. Patch, Streator, Ill.

The Executive Committee were also elected as follows: Mr. S. H. Holley, Marquette, Mich.; Mr. J. E. Griffin, Milwaukee, Wis.; Mr. Geo. W. Cope, Chicago; Mr. J. A. Penton, Detroit, Mich.; Mr. C. A. Sercomb, Milwaukee, Wis.

At the second meeting of the Association held in June, Mr. Plamondon sent in his resignation as President, saying that owing to illness in his family he would be unable to serve. The office of President was vacant until the September meeting, when Mr. Geo. M. Sargent was elected to fill the vacancy. This is the only change that has taken place in the personnel of the officials of the Association since its organization.

At the first meeting of the executive committee held on the evening of May 25th, 1893, it was decided that the proceedings of all meetings should be put in pamphlet form and sent out by mail to the members. This has always been done. In this connection I would suggest that the printing of these pamphlets be ordered discontinued for the present year at least, as the Association can hardly afford the cost of doing this work. The advertisements do not, as was expected, pay for getting the proceedings out. The proceedings of the Association are printed in full in at least three of the prominent trade papers, *The Iron Age*, *Foundry* and *The Iron Trade Review*, and it seems to be an unnecessary expense to have them printed in pamphlet form. I would suggest that some action looking to the discontinuation of these proceedings be taken this evening.

We have been addressed by several well-known writers on foundry matters in the past year. Mr. Thos. D. West, Mr. William Ferguson, Mr. H. O. Chute, Mr. E. A. Wheeler, Mr. C. K. Pittman, Mr. W. J. Keep and Dr. Edward G. Kirk, have all contributed papers to the Association. The papers read before the Association and the discussions upon them have been printed very widely in the trade papers of the country, and have done much to arouse a spirit of inquiry and research among a class of men who are too prone to take things as they find them, without giving much thought to the "whys and wherefores." The greater number of papers presented have dealt with the subject of chemistry in iron and the foundry, and this subject has been discussed not only by this Association, but by the Foundrymen's Association of Philadelphia, with the result that a considerable amount of information has been given to the trade through the agency of these two societies.

At one time the Association discussed very fully during several meetings the advisability of having its own chemist, and finally being unable to get a satisfactory answer from the various members as to the number of determinations each would want, the idea was given up, and that phase of the question was dropped for the present.

How well the Association has succeeded is shown by the fact that on May 1st of this year we have 67 members, and that the attendance at the meetings has arisen from a dozen, until at the last meeting in April, there were nearly 30 present.

At the present time the outlook for the future of the Association is very favorable, indeed, and not a meeting goes by, but that we have from three to six applications for membership presented. At the present rate of growth, it is probable that not a very long time will elapse before we have passed the hundred mark, and it is likely that within a short time the Association will be able to number among its members nearly, if not all, of the foundries of the Western States.

The Association is filling well the place for which it was intended, as a leader of thought among foundrymen, and there is no doubt that it will eventually—if the present pace is kept up—be one of the foremost mechanical societies of the country.

Respectfully submitted,
B. M. GARDNER, Secretary.

It was then moved and carried that the Association fully appreciates the labors of the officers in its behalf in the past year, and extends to them its thanks.

A motion prevailed, that the chair appoint a nominating committee of five to place in nomination names for the offices to be filled. The chair appointed as such committee, Messrs. G. W. Cope, F. W. Sargent, H. S. Vrooman, J. A. Penton and A. V. White. After deliberation, the nominating committee reported the following gentlemen as nominees for the various offices: President, Geo. M. Sargent; Vice President, C. A. Sercomb; Secretary, B. M. Gardner; Treasurer, H. S. Vrooman; Executive Committee, J. M. Sweeney, W. N. Moore, O. T. Stantial, E. C. Greenlee, H. L. Hollis.

It was moved and carried that the Secretary be empowered and instructed to cast a ballot for the nominees, which was done, and they were declared elected.

In the absence of the President, Mr. Sargent, the Vice President, Mr. C. A. Sercomb, was conducted to the chair, and made the following remarks: "Gentlemen: I thank you for this unexpected honor. I feel that the possibilities of this Association are very great. I had the honor of being the first chairman of the organization, and from the first have taken a great deal of interest in it, and have missed comparatively few meetings during the past year. I think if each one of us will talk and make an effort with his friends to bring them in, we will make an assured success of it. As those who are not members as yet see us continue to grow they will all unite with us. I know that all the Milwaukee iron men will be with us."

The names of the following gentlemen and firms were presented for membership and unanimously accepted: Mr. F. B. Whitcomb, Englewood, Ill.; Messrs. Backman, Forsyth & Co., Chicago, Ill.; The Rockford Foundry Co., Rockford, Ill.; Messrs. Pickands, Brown & Co., Chicago, Ill.; Messrs. Gardner, Campbell & Sons, Millwaukee, Ill.; Mr. R. D. Gray, Chicago, Ill.

A PRACTICAL QUERY.

The Secretary read the following letter:

CHICAGO, April 14, '94.

MR. B. M. GARDNER,
Secretary Western Foundrymen's Association, City.

DEAR SIR:—I had the pleasure of being present at your meeting of March 28th, and was very much interested in hearing the different views as to the effect of lime and water on iron. I take advantage of the suggestion of your Secretary, that foundrymen should ask questions as to any trouble they may have in their foundry practice.

I would like to ask you what benefit are the upper tuyeres in a cupola making iron? I have put in a number of cupolas in different places, and in my experience have found that the larger the tuyeres, or the more surface given them, the better are the results. One that I put in, in particular, was a 40-inch cupola, with four tuyeres, 3x9 the longest way horizontally, without upper tuyeres. I ran this cupola for some time, and the average melting for one year was 11⅞ to 1, which is the best I ever did for a long-time trial. The best single heat in that time was 14 to 1, and the heats varied from 4 to 16 tons, using a No. 6 Sturtevant fan. The average on a 4-ton heat was about 40 minutes; the larger heats 7 tons per hour from the time the blast went on, until the bottom was dropped. I do not claim that it is all because of the tuyeres that the best work was done, but partly because of the way the fan was placed, and the air conducted into the cupola. My opinion is, that the fan should be placed as near the cupola as possible, so as to run the conductor pipe straight, with as few creases or elbows as possible. Enlarge the pipe as soon as it leaves the outlet of the fan, so that the air will have more freedom, with less back pressure on the fan.

As to lime hardening iron, I have often heard that it will, but have been unable to find that it does, as far as my experience goes, after using it for years. My rule is to use as much as will make the slag run freely. I have found that limestone varies, requiring more of some kinds than it does of others to accomplish the same result. In running heats of the same kind of iron with and without limestone, I could not discover any difference in the hardness of the iron. I think that water does harden iron. One way to prevent the boiling of iron in a brick-lined ladle that is not thoroughly dried, is to drill small holes around the lower part and bottom of the ladle, so that the steam from the damp lining will have a chance to escape through the bottom of the ladle, instead of coming up through the iron. I think that wet molds make castings harder than dry ones, especially small ones. I think also, that a test bar cast in dry molds will stand a greater test than one cast in a wet one.

I shall be glad to obtain the views of the members present on these questions.

Yours very truly,
F. B. WHITCOMB.

Mr. Moore: I have had some experience regarding the placing of the blower and its relation to the cupola. I think it is a very important thing. Where there is any distance between the cupola and blower, I think the suggestion to enlarge the blower pipe immediately after leaving the fan is a very good one. In our arrangement our blower is 125 feet from the cupola. We found in a former arrangement we could get about 16 ounces at the fan. I think that is the limit of the fan pressure. We were crowded for capacity so we ran a 20-inch pipe having, if I remember rightly, about three times the capacity of the 12-inch pipe, enlarging it immediately after leaving the blower, putting in a 6-inch elbow, carrying it clear across the building, until we reached the cupola. Then we put in another 6-inch elbow, carrying it down to the cupola. After making that change we got the pressure at the cupola that we had planned. It was a gain of 4 or 5 ounces. Since that time we have put in a large cupola. We are still running with a No. 7 blower, and getting out good work. I think that with the 12-inch pipe and small elbows we could have done nothing at all. The effect of wet or dry sand upon the hardness of castings is a subject that is worthy of attention. We make some castings upon which there is a great deal of delicate tool work done. There is a portion of our shop, in which, on account of the lack of proper drainage, we cannot keep the sand as dry as it should be, and we cannot make these castings there.

Mr. Sweeney: I would like to ask Mr. Whitcomb if the additional pressure which he observed increased or improved the performance of the cupola.

Mr. Whitcomb: It did.

Mr. Sweeney: I noticed that one point was in reference to two rows of tuyeres.

Mr. Moore: Sometimes we use the upper tuyeres and sometimes we do not. I don't believe we know. I am inclined to think in a long heat they come into service.

Mr. Sweeney: I have had a little experience lately with a cupola with two rows of tuyeres and I was told that the cupola did not run as it was expected to and was not as light on coke because it had too much blast. I want to know to what extent the area of the tuyere affects the blast action of the fan. If I understand the action of the fan, it is that the pressure on the fan, of the blast, is made by reason of the fact that the current of air gets speed. If you clap a board over the end of the pipe and shut it up tight and run your fan you won't get any pressure. You must have velocity to your current of air. If it is due to the velocity why should the area of the tuyere affect the pressure on the fan? The form of tuyeres, in my judgment, should be such as to insure the penetration of the blast to the center of the cupola as nearly as possible. Therefore it seems radically wrong to introduce a tuyere which flares and is greater at the inside than at the outside of the lining. I do not believe in a flaring tuyere.

Mr. Moore: Bearing on the subject but not answering it, because I do not feel able to answer the direct question, there are a few more facts in relation to our fan experience. When we were running our fan under a 16-ounce pressure, it took all the power we could command. We got along very comfortably when we could reduce the pressure. When we got in our new cupola the pressure was reduced several ounces. A fan can be driven against about 16 or 17-ounce pressure. If the end of the blast pipe were closed up completely, the fan could be revolved, but it would be working against a pressure. The power required will be in proportion to the volume of air and the pressure. The direct question as to the shape of the tuyere, I am unable to answer. It seems as though good results were obtained by so many kinds and poor results obtained by the use of the same tuyeres under different management that I feel quite at sea on the subject.

Mr. Sweeney: In the remarks I made I think I distinguished, or intended to, between the working of the fan which resulted in pressure and the working which the fan might be doing through friction. When the pipe is stopped I call that friction. It is the air that is being carried around the fan-box. It requires more power to drive your fan after you have increased its capacity but have diminished the pressure and increased the volume. In the case which I mentioned, the cupola man informed me there was too much pressure. The pressure ought to be kept where it was, but the volume was reduced about 50 per cent. He said "Reduce the speed of the fan." The speed of the fan was reduced and the pressure was necessarily reduced. Then I wanted to know how the fan was going to maintain the pressure at half the volume. I got no answer. When the speed of the fan went down, the pressure went down.

Mr. Whitcomb: The reason I asked this question is because all modern cupolas have these upper tuyeres. I could never see that they made any point. You have got to carry the fuel up above these tuyeres to get any benefit from them.

Mr. Moore: The theory of these upper tuyeres is that they catch the carbon oxide gas. I believe in practice they are very seldom used.

Mr. Sweeney: What pressure did you have at the tuyere?

Mr. Whitcomb: I could not tell the pressure because I generally get that when the fan is running without a gauge. We have no gauge that is accurate. I have not been able to get as good results from other cupolas that had the upper tuyeres.

Mr. Greenlee: In our experience we always close the upper tuyere, except in very heavy melts. We are running at the present time twelve tons and we close the upper tuyere entirely, but when we are melting from 16 to 17 tons both tuyeres are opened. It is my impression that we do save coke when we have the upper tuyere closed, as the bed must come above the tuyere. I think that as far as the shape of the tuyere is concerned, there is not very much difference. We have a tuyere now that is large from the wind-chest and slants down from the top. I do not know that that is really any advantage, because when we had those that were straight we had just as good results.

Mr. Moore: It seems to me that this Association should have the benefit of a full description of the cupola of which Mr. Whitcomb writes and the manner of charging it.

Mr. Whitcomb: I will furnish you with a blue print.

Mr. Moore: I believe it is possible to do these things. We cannot do it, do not know how to do it. We do not do it because we waste somewhere. If we could be furnished with a blue print of the cupola and manner of charging it and the blast that was used, I think it would be of great benefit.

The Secretary read the following paper by Mr. H. L. Hollis, of Hollis & Emmerton, Chicago:

Chemical Differences of Some Russian, German and American Castings.

BY H. L. HOLLIS.

In the Russian exhibit in the Mining Building at the Fair, last Summer, were shown some very remarkable iron castings which will doubtless be recalled by all who visited this section. These consisted of small medallions, vases and other very light ornamental castings, and also thin castings of considerable size, and among these semi-spherical kettles from 6 inches to 2 feet in diameter. We obtained some of these castings for the purpose of seeing of what kind of iron they were made. Having analyzed these, we obtained a very intricate ornamental casting, made by a well-known Eastern manufacturing company, and drillings from small ornamental castings made in Germany. These were analyzed to see how they compared in composition with the Russian castings; the results are given below, and the articles from which the drillings were taken are exhibited for your inspection. Owing to the small quantity of the borings only a few determinations could be made from samples Nos. 4323, 4325, 4331 and 4332.

Analysis Number.	Description of Sample.	Silicon.	Sulphur.	Phosphor's	Mang'nese	Graph. Carbon.	Combined Carbon.
4319	Russian cast iron kettle.....	.55	.022	.554	.283	3.02	1.09
4323	Russian cast iron medallion...	.60	.....	.584	.287	.....	.....
4325	Russian ornamental cast iron plate	.59	.....	.557	.450	.....	.....
4321	American ornamental cast iron plate.....	2 90	.49	.694	.544	2.62	.64
4331	Small German ornamental casting.....	2.08	.....	.562	.480	.....	.....
4332	Small German ornamental casting.....	2 26	.....	.441	.....	3.54	.16

Analyses of 4319 and 4321 revealed only a trace of aluminum. These analyses, it will be noticed, differ very widely, and what will probably cause the most surprise is the very low silicon of the Russian castings. The explanation of this is that the Russion iron is, presumably, cold-blast charcoal iron. About the American castings the following has been received:

STAMFORD, CONN., April 16th, 1894.

B. M. GARDNER, Esq.,
1141 Monadnock Block, Chicago.

DEAR SIR:—The iron from which these plates were made is composed of No. 1 Low Moor, with equal proportion of No. 1 Mary, and 20 to 25 per cent. of scrap consisting of sprues from previous castings. The facing on the mold is best plumbago, and the pattern is returned or "printed." The iron is poured quite hot, the mold being made in No. 0 Albany sand mixed with old sand and the sea coal and ground in the mill. The time required for molding one of these trays is about 30 minutes, being molded singly, although usually a number are poured at a time, as many as 50 having sometimes run at one heat, as we frequently have occasion to furnish these as examples of our work, where we do not care to furnish examples of our hardware.

The writer had the opportunity of examining the Russian castings closely while at the World's Fair last summer, and among them noted especially some of this identical subject, and it is interesting to note that the foreman of our foundry, an experienced Scotchman, recollects seeing castings made from this place in his early youth in Scotland, and has also heard one of his early companions state that he had also seen the same pattern used in making iron castings in Odessa, Russia. If it is possible for you at any time to obtain any data about the original of the design, as to its country and the establishment, I would be very much indebted to you for the information as I have been endeavoring to obtain it for some time. The original casting owned by this company was brought from the Carron Iron Works, in Scotland, a number of years ago by our president, Mr. Henry R. Towne.

I am somewhat familiar with the character of fine metal work made in Russia from personal and family connections in that country and while I appreciate the very fine work done there, I am of the opinion that it is more due to the fine character of the original models, than to any especial features connected with the molding or casting—with the exception, of course, that all Russian irons are notably free from impurities and also that modellers and workmen generally in that country are given unlimited time, almost, in which to execute work of this sort in marked distinction to the urgent methods of modern business in which castings are made in this country. Notwithstanding these points, however, it is believed that you will find the comparison of these castings with the Russian ones not greatly to our disadvantage, especially when you recollect that these castings are not in any way different from our ordinary hardware metal work, and that we have never considered this plate as an especially difficult one to cast.

The above comprises all the information in our hands at present concerning this plate and the methods of its manufacture, as we have found by experience that "trade secrets" in this line of work are of little value as compared with care and skill which comes from long experience and intelligent supervision. Yours truly,

The Yale & Towne Mfg. Co.,
H. H. SUPLEE, Edt. Mgr.

In order that those who have been so energetic in condemning the use of analyses for foundry purposes may not use these analyses as an argument for their side, we would like to say a few words on this matter of the use of analyses for foundry work.

In our opinion a great deal of harm has been done by the extreme views of some of the chemists and the "anti-chemists," if we may use the term. The influence of the temperature of the iron, nature of the molding sand, and, in fact, all of the conditions of a foundry, which may vary, have a controlling influence on the product, and it is admitted by all that the temperature and the rate of cooling are elements which to a large extent control the proportions of combined and graphitic carbon, especially in small castings. But having found a mixture of iron that gives satisfactory results, there is no question but that if the chemical composition of this mixture is radically changed, other conditions remaining as before, the same result cannot be obtained in the castings. Having found the chemical composition of a mixture working satisfactorily, the value of analyses comes from being able then to duplicate this with a certainty, and we do not believe that this is possible without the aid of analyses.

In general, a certain chemical formula could be given for iron for a certain purpose, but the foundry manipulations could not be the same in different places, and hence the same results could not be obtained. But in the absence of other data that is as good as any way of starting experiments to find out the best mixture. But having determined the satisfactory composition for a certain purpose under certain conditions, it will be found that the duplication of results can be most certainly obtained on duplicating the chemical composition of the mixture; and now that nearly all the Northern furnaces, at any rate, are prepared to sell on analysis, and stock their iron with this end in view, this method of regulating the mixture is in every way practicable.

The several castings referred to in the paper were on exhibition, and were examined by the members present.

A paper by Mr. Thos. D. West entitled, "Round vs. Square Test Bars, and the Utility of Transverse, Tensile, Crushing and Impact Tests for Cast Iron," was reported as being in the hands of the Secretary, and owing to the lateness of the hour, it was ordered held over for the June meeting.

The meeting then adjourned.

THE mills of the Mahoning Valley Iron Co., and all departments of the Union Iron & Steel Co.'s lower mill, at Youngstown, O., have shut down because of a lack of coal.

ROUND vs. SQUARE TEST BARS.*

And the Utility of Transverse, Tensile, Crushing and Impact Tests for Cast Iron.

BY THOS. D. WEST.

There is no one element in iron founding at the present day showing more need of uniformity and simplicity in methods than the testing of cast iron. The Foundrymen's Associations could not at present do a more important work than to adopt some system which, in their judgment, would be most favorable to obtain comparisons in the relative strength of cast iron. Present methods are subject to serious criticism. There is practically no science involved in their application. The systems in use are a complication of old-time practices, which, instead of enlightening, can only confound; and, considering the advancement of metallurgy and chemistry, it is a matter of surprise that these systems are tolerated by practical men. I lay no claim here to advancing new discoveries for your consideration, but I will say that long experience and study in various branches of heavy founding and testing cast iron enable me to utilize what, I think, all will concede to be practical, common-sense metallurgy and founding.

The first question to be considered, before adopting any standard system, is the class of tests necessary to founding, and to have them as few and simple as possible.

The tests called for in our engineering and other scientific text books include transverse, tensile and crushing strength, a few giving impact. Of all these, none can surpass in value the transverse test, with its accompaniment, deflection; and, I firmly believe, if we only had some recognized standard system for testing the transverse strength, deflection, contraction and chill of cast iron, we could, in a few years, wholly ignore tensile and crushing tests taken from test bars for general purposes.

The most valuable test next to transverse is tensile. With a standard length of bar for transverse strength, with one of equal area for tensile testing, and having the special form of bar advocated below, my study on comparisons leads me to say that transverse and tensile tests bear a very close relation to each other. With round test bars for both transverse and tensile tests, I am satisfied future statistics will demonstrate that the latter test may, for general purposes, be abolished. One objection to statistics giving tensile strength lies in the method of obtaining them. Some machines can take such a rigid grip as to exert a strain on some portion of the specimen, instead of permitting the test bar to adjust itself centrally so as to insure a uniform pull over its entire breaking section. Cast iron being a very rigid metal, requires different treatment from steel or wrought iron, and in another paper I shall go more into the details of tensile tests, and describe a special form of a test bar, and mode for gripping the same. The American Society of Mechanical Engineers are at the present time giving much attention to the question of tensile tests at the members' monthly meetings, and I would be pleased to learn of their taking note of the objection herein made to present methods of testing cast iron.

The quality of cast iron to withstand crushing loads is one of much importance to the engineer and founder. The statistics which I have found, from which the relation between crushing and tensile strength could be deduced, lead me to affirm that the elements constituting a test in transverse, deflection and chill, are a correct index to the crushing strength, for general purposes, if the round test bar and some system such as these papers are advocating would be adopted as a standard. I will say that an iron having a high transverse strength combined with small deflection would prove the best to withstand crushing loads.

Impact tests upon the sides of test bars, I consider of no practical value in aiding to determine what castings could withstand from shocks or blows. If there is any form of tests with test bars to assert the power of iron to withstand shocks or blows, there is much more practical sense exhibited in looking to high transverse and deflection combined with a low contraction and chill, than to impact blows on the side of a test bar, and as intimated in my paper read before the Foundry Association, at Philadelphia, May 2d, the real practical way to apply an impact test is to the castings themselves, or on small models duplicating their exact proportion.

The car wheel men teach us a practical lesson in this respect. Here we find the inspector selects from a large stock, one wheel out of every hundred, and if by dropping a 140-pound weight on the hubs of the sample wheels from a height of 12 feet, the sample wheels stand five blows each, all the other wheels are then accepted. We make no attempt to deserihe the details of these tests. We only outline the general plan to illustrate the absurdity of thinking to be guided by impact blows on the side of test bars.

The power of castings to withstand shocks or blows is often far more affected by their proportion or design than by the quality of iron composing them. There is altogether too much indifference exhibited by designers of machinery to proportioning castings so as to have the least possible internal contraction strain in them. Some designers seem to ignore wholly the fact that a light body will contract more than a heavy one.

Many castings have been made, the iron in which would test all right as far as test bars were concerned, but subjecting them to shocks or blows, would show that the iron was not good or of the right character. I know of no better test to illustrate the worthlessness of impact tests on test bars and the importance of proportioning castings well, than to recall an experiment I made many years back with a mould four inches by nine inches, 14 feet long, alongside of which was another mould exactly the same length but differing in thickness, being one-half inch by two inches. Both moulds were cast at the same time out of the same ladle, the metal running in at one gate to each mould so that it could not but be the same in each casting. The smaller one contracted seven-eighths of an inch more than the other. This fact illustrates the impracticability of impact tests on test bars and shows that a poor iron could often be of much more value in a well proportioned casting than a good iron in an ill-proportioned casting.

Taking the following observations on round vs. square test bars in connection with the above, I believe that practical men will agree with the writer's prediction that in the near future transverse, deflection, contraction and chill will be sufficient to guide us in testing cast iron for all general purposes.

ROUND VS. SQUARE TEST BARS.

For all time back the square test bar cast flat has been the method used. As far as my knowledge goes I was the first to suggest the use of a round test bar, in an article in the *American Machinist*, June 6th, 1889. I propose now to show that the square bar cast flat is the most unmechanical, unreliable and unscientific form for a test bar that could possibly be devised and that we can never make true relative comparisons of the strength of cast iron or compare chemical and physical qualities by its use.

Let us first take up the question of radiation of heat from castings. All experienced heavy-work founders know that the longer metal remains fluid in a mould, the larger are the crystals in the resulting castings, and also, the lower the temperature at which metal is poured the more rapidly it cools to solidification and can thus give closer grain and smaller crystals to the shell or skin of a casting. Whether this could be a cause of increased strength in a casting or test bar depends upon the character of metal used, in connection with the proportion and design of a casting or test bar. Metal in cooling arranges its crystals in lines perpendicular to the bounding planes of the mass, or in other words, the crystals arrange themselves along the lines the waves of heat travel in passing outward from the casting as it cools off. To assist in understanding this subject, I have taken the following description and cuts, Figs. 1 and 2, from Spretson's work on founding. Speaking of the cuts, Mr. Spretson says: "In the round bar the crystals are all radiating from the center. In the square bar they are arranged perpendicular to the four sides, and hence have four lines, in the diagonals of the square, in which terminal planes of the crystals abut or interlock, and about which the crystallization is always confused and irregular." This is said to be very plainly exhibited by effect of manganese in steel castings of round and square fracture.

A study of Figs. 1 and 2 impresses us with the importance of arranging for the greatest possible uniformity in providing for the radiation of heat from a test specimen, and also to

* Prepared for the meeting of the Western Foundrymen's Association, at Chicago, Wednesday May 16, 1894.

afford it the most favorable conditions to arrange its crystals uniformly. It requires no great stretch of the imagination to conceive what a great influence the simple matter of difference in the temperature of the sand in a mould could have in causing non-uniformity in the radiator lines of a square bar compared to the even structure possible in a round bar. Mr. John E. Fry, in a paper before the Eastern Association, May 2d, criticizing Keep's ½″ square test bars, beautifully illustrates the effect of a little variation in the temperature of sand

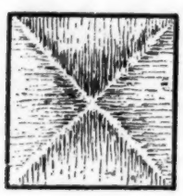

FIG. 1.

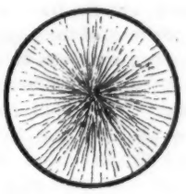

FIG. 2.

in making such square bars wholly unreliable as a test for the relative strength of any kind of cast iron.

Before leaving Figs. 1 and 2, let me call attention to their clear exemplification of the necessity of casting test bars on end, in order to insure uniform cooling off. The heavy-work founder knows that metal first solidifies at the bottom of a mould, and if he is "feeding" a heavy casting, the metal, by solidifying at the bottom first, will gradually force his "feeding rod" upward, thus demonstrating that the greatest line for radiation or line for heat to escape is upward, or through the cope of a mould. For this reason, if we would break a casting a foot square into halves down the center of its vertical position, as when cast, we would find the last spot to solidify would generally be about 4″ from the top, or one-third its height below the cope surface. It makes no difference how small a body of metal may be, the same principle is applicable to it as to the large body, and goes to fully demonstrate the irregularity for a central point of latest solidification which must exist in a test bar cast flat. Then again, uneven cooling off is bound to cause more or less internal contraction strain in a test bar. It must be evident that a test bar cast on end will have an equal radiation from all portions of its surface, at any height and thus give the best opportunity to lessen strain, as far as cooling off has any effect.

I would now call attention to the most serious objection that can be cited against the adoption of a square test bar, whether cast flat, on end or any other way—an objection sufficient a hundred times over to condemn the square bar. The nature of all cast iron is such that any elements in a mould possessing heat-conducting powers will either chill or make closer the grain of the metal in the skin or surface of a casting or test bar. Mr. Fry stated in his paper of May 2d, at Philadelphia, that test bars poured, one in a "dry sand" mould and one in a "green sand," out of the same ladle and at the same pouring would show radical differences in strength. The point is well made and illustrates how sensitive liquid metal is to the chilling influence of damp sand. We all know that there is a great difference in iron in its susceptibility to elements tending to chill. Some irons if poured into a sand mould would show a grey fracture, but if poured into an iron or very damp sand mould would show at the surface a white or chilled iron, the depth of which of course depends upon the character of the iron, the thickness of the casting, etc. Let me call your attention to Figs. 3 and 4. It would be almost absurd to think of practical men being called upon to discuss the merits of these two forms, but that we find the whole world using the square bar. We must confess it leads one to hesitate to show the courage of his conviction, but we have good cause to kick out of practice such an erratic, unscientific relic of the dark ages as the square test bar.

We will now size up the effect of the square test bar in making comparisons of cast iron from two different founders. A, writes to B and C to send him a sample of their iron in a half inch or one inch square test bar, so that he can test their iron for strength and whichever proves the strongest will get the job. A knows about as much as a great number of other casting buyers and he is just as liable to have light and heavy work shops bid for his work as to confine the bid to two shops making a specialty of the same class of work. It is astonishing how brilliant some buyers are in this respect. Well, A has received his test bars, has broken them, and has let his job to the firm making the most rotten iron. While this may seem exaggerated, I will say that nine times out of ten it could be the case. All experienced men know that a soft iron such as light-work shops use, cannot be as strong as that used for heavy machinery. Where a small test bar is employed, the soft iron by having considerable of its area held in a combined carbon state, as can easily be the case, can show greater strength than the natural qualities of the iron possess and the duller soft iron is poured, in a small square test bar, the more deceptive will it be in showing strength. It is this very fact that has led Mr. Keep to draw wrong conclusions and obtain results different from what others have obtained, on the question whether hot or dull poured test bars would give the stronger iron.

Now, let us take a common sense view of the question. In Fig. 3 we see an irregular circle outside of which we find the deepest close-grained sections at the corners A B; and the lower iron is in silicon and the damper the sand the deeper will these corners chill, or close up the grain of the iron. There is a limit to the extent to which combined carbon, shown in the closing of the grain, can increase strength in a small test bar, where it is combined with a small soft center or a graphitic core, as seen at D. A small test bar can, by a radical difference in grain of the core and the shell, embody such contraction strains within its own elements as to break with a lighter load compared with what the true natural qualities of metal would exhibit by actual working results in castings, or from turned test bars. This readily explains why A can be deceived, and how he can do injustice to the founder that in reality would have given him the strongest casting. I do not wish to be understood as saying the soft iron would always show the greatest strength with square test bars, as the degree of softness in the iron, and the temperature or dampness of the sand comprising a mould has every influence in changing results in the surface or shell of a casting. I will say that while a square bar is such an erratic, crazy thing one cannot say what it will do, the chances are more in favor of its showing many grades of iron to be just the opposite of what a testing of turned test bars, or a use of the casting would demonstrate. This is especially true where square bars as small as ½″ are used. The purport and importance of the above reference to "turned or planed bars" will be understood by referring to the closing portion of this paper.

Let us now turn our attention to the round bar, Fig. 4. It surely requires but little observation to impress one with the regularity of its outline comprising the chilled or close grained metal; and it appears like adding insult to injury to discuss

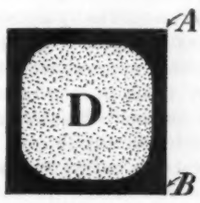

FIG. 3.

FIG. 4

the favorable conditions it presents over a square bar in permitting iron to show its true natural strength. I am not asking any one to decide the merits of the question as exhibited by the cuts showing the section of the round and square bars. Any foundryman can cast square and round test bars, and the duller they are poured, the lower in silicon the iron and the damper the sand used, the more pronounced will be the defects of a square bar, as illustrated at A and B, Fig. 3.

It is an utter impossibility for us ever to make comparison of the true qualities of cast iron, or fathom the many phenomena involving chemical and physical comparisons now awaiting investigation, as long as we use a square test bar. Nothing proves this more than the radical difference between Mr. Keep's experience and that of others in regard to hot and dull poured metal giving the strongest test bars. Even in a specialty shop, in testing different shipments of iron supposed to contain a standard mixture, the square bar is wholly unre-

liable, to say nothing about one shop trying to make comparison with another, or establishing a basis for research in the phenomena of cast iron. I cannot resist the conviction that the subject having now been taken up, it will be but a few years when the square test bar will be a thing of the past. I know Mr. Keep claims to have been twenty years studying on various sizes and shapes, and after such research "hit" on his ½" square test bars, but nevertheless I cannot agree with him that its being "a sensitive bar" is a reason why we should approve of it as the most favorable size and form to ascertain the natural strength of cast iron. Some might claim that a square bar is best owing to its having such a broad area to resist compression and extension as the load is being applied: But it is a well known fact that cast iron offers a much greater resistance to compression than it does to extension. I claim that in view of the effect of high or low silicon iron in causing varying thickness of the close grained shell, as seen at A and B, Fig. 3, and the effects of the temperature at which the iron is poured and dampness of the mould, that the very fact of there being a difference in compression and extension resistance only aggravates the evils and objections which have been here cited against the use of a square test bar.

Another objection to a half inch test bar not to be lost sight of, is the radically false relation it bears to a one inch bar. This cannot be better illustrated than by quoting from Mr. Outerbridge's discussion on the writer's paper, read at Philadelphia, on May 2. He says: "A bar which will break at 500 pounds dead load on a one-half inch section, supports 12 inches apart, means a strength of 4,000 pounds per square inch transverse on one inch bar with supports 12 inches apart." Any one having experience in testing transverse strength, knows this would mean a strength away beyond what any ordinary strong machinery mixture could give, say nothing about stove plate. But after all, we may be forgetting "there are tricks in all trades." I confess I did not think of this before. My zeal to ascertain true relative qualities of iron bars evidently got the better of sophistication. It has not gone so far, however, but that we can use the one-half inch bar to sell by, where it would show the strongest test, and the one-inch round bar in the rough or turned, to investigate phenomena, or learn the true natural strength of any cast iron, should it be thought wise not to part with any "tricks in trade."

I do not wish to be understood as saying that a round test bar would insure perfectly true data. There is only one way to attain this and that is by turning off the outer surface of a round test bar until the grain which has been radically affected by the chill of the mould surfaces is all removed. The depth of such turning would depend on the character of the metal used. Iron high in silicon would not of course require so much stock to be removed as iron low in silicon. For very nice questions in the phenomena of cast iron, such for instance as which gives the stronger iron, a hot or dull poured metal, the only exact way to settle the point would be by means of turned bars, or planed square bars, as referred to in the writer's Philadelphia paper. For the best approximate information regarding cast iron obtained by means of rough cast test bars, I am at a loss to conceive how anyone with the facts before him, as herein set forth, can scientifically support and argue for the adoption of a square test bar, especially one as small as Mr. Keep advocates. When we consider the uniformity of crust and radiation that a round bar cast on end makes practical, and then look at a square bar cast flat, it does seem that we do not require any science, but that a little use of common sense is sufficient to guide us aright in deciding which of the two forms is the more liable to closely approximate the natural qualities of cast iron.

There is much to be said upon the subject of moulding and casting test bars, as I know of no system at the present day that even in this respect is properly arranged. In other writings I shall treat of new methods for moulding, casting and obtaining the contraction and chill combined with the size, etc., of test bars, also other factors pertaining to cast iron, chemically and physically which I think will be considered as of value to aid us in throwing light on many problems now awaiting investigation.

THE Akron Iron Co.'s mill, at Akron, O., has taken a number of orders recently, and started all departments in full on Monday.

FLUIDITY IN STEEL FOR CASTINGS.

One of the principal papers read at the Spring meeting of the British Iron and Steel Institute, at London, May 2 and 3, was that of Mr. George J. Snelus, on "The Walrand-Legenisel Process as Applied to Steel Castings." It went, at great detail, into the experiments carried out at Paris by Messrs. Walrand and Legenisel, and described the operation of an installation at the Schneider Works, at Le Creusot, which the writer had visited. At these latter works some excellent steel castings were shown, chiefly tram wheels, cast in green sand. The opening portions of the paper, giving a general statement as to the process, are given below:

"Many attempts have been made to get over the difficulty of want of fluidity in small converter charges, but as far as the author knows there has hitherto been little success in this direction. Mr. Legenisel began his experiments, in 1884, with a small converter of 5 cwt., erected at his fonndry in Paris. Being a large producer of malleable castings, he sought to extend his operations by adding steel castings, but he met with no success, owing to the difficulty of keeping the metal fluid. Mr. Walrand joined Mr. Legenisel in 1891, and, after many experiments which were practical failures, the idea suggested itself of blowing the metal in the ordinary way till the flame dropped, then turning down, and after adding a quantity of fluid ferro-silicon, blowing again for a short period, producing, as in the basic process, an afterblow, during which a large amount of heat is generated by the rapid combustion of the added silicon, with the further advantage that as the silicon burns to a solid the metal is left free from gas, and what gas it did contain is more easily eliminated by the greater fluidity of the metal.

"This idea of getting more fluid metal by an afterblow in which the substance burnt should produce a solid, so as to reduce the occluded gases in the bath, was entertained by the author some ten years ago, and a large number of blows were made at the West Cumberland Works by turning down the vessel at the drop of the flame, then adding spiegeleisen and blowing again for some two minutes, to burn out the added manganese. The metal was found to be undoubtedly more fluid and freer from gas cavities than ordinary metal, but the difference was not so great as to warrant continuing the process. Ferro-silicon did not commend itself to the author at the time, as he was making rail steel, and had always a dread of excess of silicon with high carbon. From the analytical results given below it appears that this was a groundless cause for alarm, as there appears to be no difficulty in practically eliminating the added silicon by the afterblow. Silicon has two distinct advantages over manganese for this purpose—1st, it generates a much greater quantity of heat, unit for unit; 2d, the time to terminate the afterblow is better marked by the flame indication when silicon is used. The chief difficulty met with by the author in his experiments was this want of indication when to discontinue the afterblow, and he tried, 1st, to judge by the flame; 2d, by the spectroscope; 3d, by adding always a definite portion of manganese and passing the same volume of air through the vessel, judging the quantity, 1st, by the time of blowing; and 2d, by the number of strokes of the blowing engine. It will probably be asked, why not begin by using a more silicious pig iron to start with, or by adding the ferro-silicon during the ordinary blowing? These plans have been tried, and have not proved satisfactory, because in either case the heat generated by the combustion of the extra silicon is largely carried out of the converter by the great volume of gas going off, and second, because when an excess of silicon is used in this way, it is difficult to get rid of it entirely before the carbon is all burnt.

"The Walrand process, then, consists in simply adding to the metal at the end of the ordinary blow, a definite quantity of melted ferro-silicon, then making the afterblow, turning down when the extra silicon has been burnt out, and adding the ordinary final additions of ferro-manganese, etc., as circumstances require. The advantage is 1st, that you can use an ordinary Bessemer pig iron with ⅔ per cent. silicon, thus insuring a steel comparatively free of silicon; 2d, that the combustion of the added silicon produces such a large amount of heat at the right time, and so rapidly that the metal becomes very fluid; 3d, that as the silicon burns to a solid it leaves the metal comparatively free of gas, and the steel is sound and

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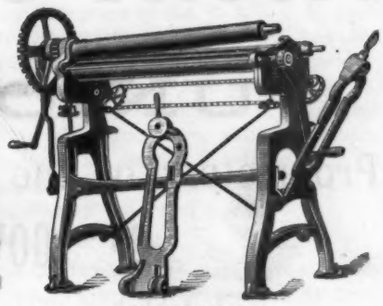
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free from gas cavities; 4th, that in consequence of the metal being so fluid and already free from oxide of iron, the ferro-manganese or other substances added, such as aluminum, are more effective and remain in the final steel; 5th, that in consequence of the great fluidity of the metal, much more time and facility is given for casting operations."

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Chicago, Ill.—James, Grant & Foote; capital, $18,000; for manufacturing cut gearing and machinery; incorporators: Jno. Grant, David Owen James, Jno. Byrugon Foote. Address letters care of C. L. Mahoney, 1211 Ashland Blk., Chicago, Ill.

Chicago, Ill.—Winslow Bros. Elevator Co.; capital, $100,000; to manufacture and deal in elevators, elevator machinery and hoisting apparatus; incorporators: Francis A. Winslow, Edw. O. Brown, Geo. Packard. Address letters care of Peckham & Brown, 518 1st National Bank Bldg., Chicago, Ill.

Philadelphia, Pa.—The Fowler Radiator & Mfg. Co.; capital, $100,000; for the manufacture of steam and heating appliances; incorporators: T. B. Belfield, Arthur H. Fowler, Philadelphia, Pa.; Jno H. Waters, Johnstown, Pa. Address letters care of A. B. Weimer, 512 Walnut St., Philadelphia, Pa.

Chicago, Ill.—American Cotton Picker Co., capital, $500,000; to manufacture, deal in and operate cotton, harvesting and other agricultural machinery and implements.; incorporators: J. N. Hanson, W. U. Williams, J. W. Dyrenforth. Address letters care of Dyrenforth & Dyrenforth, 225 Dearborn street, Chicago, Ill.

Pittsburg, Pa.—The Star Bolt & Tool Co. (incorporated in W. Va.); capital, $200,000; for the manufacture and sale of bolts, nuts, washers, tools, implements, etc.; incorporators: J. C. Jamison, Pittsburg, Pa.; Henry Monath, Jr., Homestead, Pa.; E. Barrick. Address letters care of Chas. A. O'Brien, 402 Grant St., Pittsburg, Pa.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

Creamery Package Mfg. Co., 1, 3 and 5 W. Washington st., Chicago, want a 5 or 6 ft. iron lathe, a drill and a blacksmith forge, all in good condition, second hand and cheap.

The Direct Separator Co., of Syracuse, N. Y., who will manufacture steam separators, expect to be ready to fill orders in 60 days. They will be in the market for belting, for drilling machines, twist drills, pulleys, hangers and shafting, pipe cutting and threading machinery, lathes, paint, files, punching and shearing press, sheet copper, Russia iron, gas pipe and malleable castings.

The Supervising Architect, Washington, D. C., will receive sealed proposals until 2 P. M., June 11, 1894, for all the labor and materials required to put in place, complete, the first, second, third and fourth story columns, the second, third, fourth and fifth floor beams, girders, etc., for the U. S. Post-office, Court House and Custom House at Milwaukee, Wis.

New Construction:—

The New Bedford (Mass.) Boiler & Machine Co. will put up a new brick shop 125x60 feet, two stories.

F. Hennebohl, who already has a machine shop in South Chicago, is about to add a foundry to his plant.

Plumb, Burdict & Barnard, of Buffalo, have begun work on their new factory at North Tonawanda. It will be operated by electric power.

Additions, Enlargements, Removals, Etc.:—

The Appleton Mfg. Co., Appleton, Wis., are removing to Geneva, Ill.

The Pittsburg Crushed Steel Co., Ltd., have completed an addition 60x100 feet.

It is stated that the Chicago & South-Eastern railroad will move its shops from Lebanon to Muncie, Ind.

The Kalamazoo Foundry & Machine Co., Kalamazoo, Mich., are building an addition, 52x75 feet, to their foundry and machine shop.

An addition will be built to the molding shop of the Addyston Pipe & Steel Works, at Cincinnati, which will nearly double the capacity of the works.

Fires and Accidents:—

The Climax Road Machine Co.'s plant, at Marathon, Westchester Co., N. Y., burned May 17. Loss $25,000, insurance $11,000. About 100 machines in process of manufacture were destroyed. The factory will be rebuilt, but probably at a place with better shipping facilities.

General Industrial Notes:—

The Dunbar furnace, at Dunbar, Pa., has blown in again.

The blast furnaces at Steubenville have closed on account of the coke famine.

The Atlantic Iron Works, at Sharon, Pa., long inactive, are preparing to run with natural gas.

A change from billets to rails was made at the Edgar Thomson Steel Works, Thursday, May 17.

The Ohio Iron Co., at Zanesville, O., deny that they have decided to close down indefinitely.

The Cummings Foundry Co., of Chicago, expect to start their new foundry plant within a few days.

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Representatives of leading wire nail mills met at Pittsburg, May 17, and decided to advance prices 10 cents a keg.

The Mahoning Valley Iron Co., Youngstown, O., have been compelled to shut down on account of the coal famine.

The Cambridge Iron & Steel Co., of Cambridge, O., are fortunate in having several thousand tons of coal in store.

At Chester, Pa., the Bessemer department of the Wellman Iron & Steel Co.'s works resumed on a 1,000 ton order with 125 men.

The new furnace of the Bellaire (O.) Nail Works Co. will be 18x75 feet and will have a capacity of 200 tons. The contract calls for four Massick & Crookes stoves.

The Boston Casting Co. have succeeded to the business of the Wrought Iron Casting Co., having purchased their plant at 122 West First street, South Boston, Mass.

The citizens of Girard, O., do not seem disposed to take the $10,000 of the Girard Stove & Foundry Co.'s stock in accordance with the conditions imposed by the company on its remaining in Girard.

The Arrow Nail Plant, of Anderson, Ind., passed under control of Chicago capitalists, May 15. Extensive repairs are to be made and a rod and wire mill are to be added. The company will employ 700 men.

The Wisconsin Iron & Wire Works Co., of Milwaukee, Wis., recently organized to buy the Reliance Wire Works, have $30,000 capital. G. H. Norris is president, J. G. Beckley, vice-president, and J. H. Gilman, secretary and treasurer.

William K. Ackerman and James H. Wilson, assignees for the Grant Locomotive Works, offer for sale the property at Twelfth st. and Robinson ave., Chicago. It cost over $800,000 two years ago, and will be sold subject to mortgages of $225,000.

F. M. Hicks & Co., of Chicago, manufacturers of the Raymond gas engine, which was illustrated in these columns lately, have removed their office from 386-388 Throop St., to 68 and 70 S. Canal St. At their new location they show several of the Raymond gas engines ready to run.

The Chicago Emery Wheel Co., manufacturers of emery and corundum wheels, have moved their office from the Rookery to 4 S. Canal St., Chicago, where they have a store in the heart of the machinery district. They have in their window a case showing the various sizes and designs of wheels made by them.

Recently, T. M. Richards, of the Ellwood City Tin Plate Mill, rolled a sheet of steel to the remarkable thinness of a little less than a two thousandth part of an inch, as measured by the micrometer. The sample shown is of remarkable evenness and entirely free from holes of any kind.—[New Castle, Pa., Guardian.

The office of the Underwriters' Fire Sprinkler Co., of Chicago, manufacturers of the Pierce system of automatic sprinklers, has been removed from room 333, 315 Dearborn St., to room 1141 Monadnock, Chicago. The office is under the management of O. Pierce, vice president and general manager of the company.

Judgments aggregating $8,477 were entered against the McKinley Tin Plate Co., of Wilkinsburg, Pa., in Pittsburg courts in favor of E. S. Wangenheim, a stockholder. The company was organized in June, 1892, with a capital of $50,000. About $12,000 has been paid in. The assets are $15,000 and the liabilities are about the same.

The Tennessee Coal, Iron & Railroad Co.'s Sewanee Furnace at Cowan, Tenn., produced 4,238 tons in 29 days, in April, an average of 146 tons. Ninety per cent. was foundry iron. The ore yielded 50.3 per cent. of iron. Consumption of limestone was .67 ton per ton of iron and fuel consumption was 2,400 pounds per ton of iron of 2,268 pounds.

The fuel strike has caused some shut downs at Pittsburg. The Pittsburg Wire Works, at Braddock, have closed down, throwing out 450 men. At Rankin, the Braddock wire works suspended operations and 700 men are idle. The Duquesne forge at Rankin also closed. Furnaces H, I and B, of the Carnegie plant at Braddock, have been blown out. Furnaces H and B will be remodeled.

At Hamilton, O., ex-Gov. James E. Campbell, of Ohio, and his sister, Mrs. Joseph Owens, will commence suit against the Hooven, Owens & Rentschler Co., to recover $170,000 on 300 shares of the stock, which Mr. Campbell had hypothecated for a loan of $58,000. The stock was worth $225,000, and was to be returned when the $58,000 was paid, but when the amount was tendered the company refused to accept it.

Home Seekers' Excursion via Pennsylvania Lines.

May 29th special excursion tickets to points in Northwest, West, Southwest and South will be sold at principal ticket stations on the Pennsylvania Lines. Tickets will be good returning thirty days. For details please apply to nearest Pennsylvania Line Ticket Agent, or address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Pa.

Ohio Excursion Rates via Pennsylvania Lines in June.

Special excursion tickets to points in Ohio will be sold from ticket stations on the Pennsylvania Lines in that State at reduced round trip rates as follows:

To Columbus, June 4th and 5th, good returning until June 7th, account Republican State Convention.

To Dayton, June 4th and 5th, account Sunday School Association meeting. Tickets good returning until June 8th, inclusive.

To Columbus, June 5th and 6th, good returning until June 9th, inclusive, account Prohibition Party Convention.

To Delaware, June 24th and 25th, for the Teachers' Association meeting. Return coupons valid until June 30th, inclusive.

To Akron, account State Epworth League meeting, June 25th and 26th, good to return until June 29th, inclusive.

For particulars and time of trains, apply to nearest Pennsylvania Line Ticket Agent.

THE Cleveland Twist Drill Co. have received the following unsolicited testimony from a practical man in the employ of one of the largest railroads in the country: "The drills which you have furnished us are the best I know of. I have drilled two holes in a 66-lb. steel rail, with two men, in exactly four minutes. They very often have drilled 100 holes without being sharpened, and I have one instance of 120 holes by accurate count, without sharpening the drill." The drills referred to were used in one of the well known track drills which are run by hand power.

AN edition of the souvenir maps of the Y. P. S. C. E. Convention to be held July 11th to 15th, at Cleveland, O., has been issued to the Nickel Plate Road, the shortest through passenger line between Buffalo and Chicago. Any person who expects to attend this convention and desiring one of these maps can have it forwarded to his address free, with the compliments of this low rate line. Requisition should be made on the Advertising Department of the Nickel Plate Road, Cleveland, O. B. F. Horner, General Passenger Agent.

FLOODS in Pennsylvania the past three days have seriously interrupted the operation of iron and steel works. At Bethlehem, the Bethlehem Iron Co.'s mills shut down Monday owing to their inundation. All the iron works along the river at Pottstown suspended operations. The Cambria Iron Co., at Johnstown, sustained considerable losses. All mills on the Susquehanna and Schuylkill rivers were forced to shut down on account of high water. At Harrisburg the men were unable to get to the mills.

THE American Pig Iron Storage Warrant Co.'s stocks of pig iron have practically reached the 100,000-ton mark. On May 20, the total was 99,700 tons. There were put in yard in the 20 days preceding, 2,400 tons and 100 tons were withdrawn.

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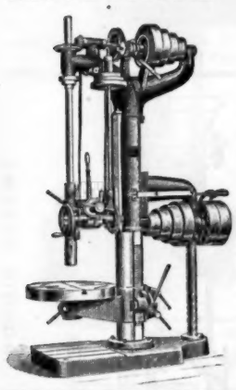

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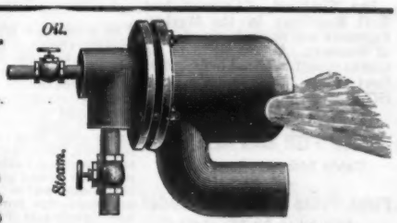

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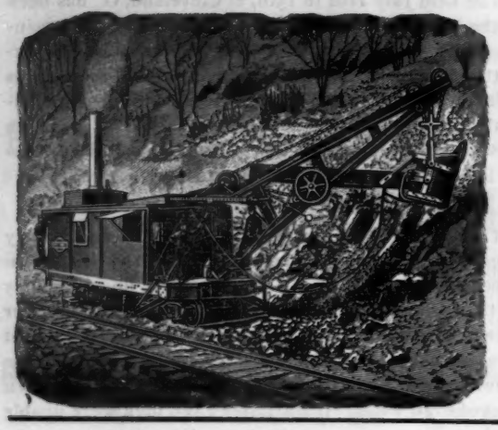

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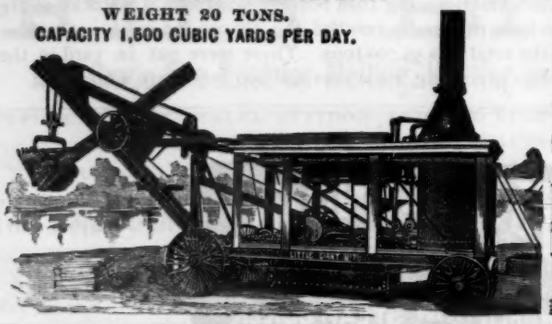

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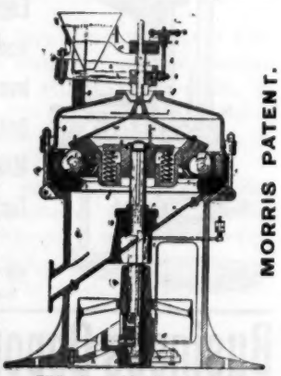

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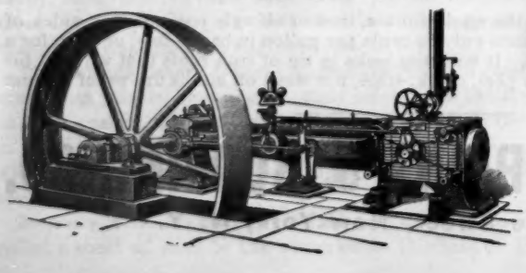

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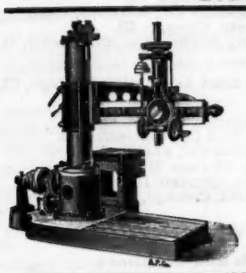

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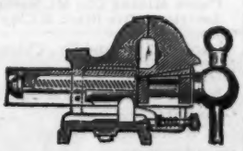

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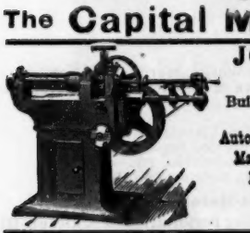

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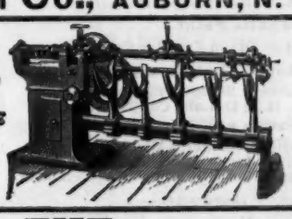

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Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7.45 am	†11.55 am
Pittsburgh, Bellaire and East	†12.45 pm	† 6.25 pm
Philadelphia and New York	* 1.40 pm	*11.15 am
Baltimore and Washington	* 1.40 pm	*11.15 am
Alliance and Pittsburgh	* 1.40 pm	*11.15 am
Ravenna and Alliance	† 3.25 pm	† 9.50 am
Hudson and Ravenna	* 5 .0 pm	* 8.25 am
Philadelphia and New York	*11.10 pm	* 5.25 am
Baltimore and Washington	*11.10 pm	* 5.25 am
Alliance and Pittsburgh	*11.10 pm	* 5.25 am

Mt. Vernon and Pan-Handle Route.

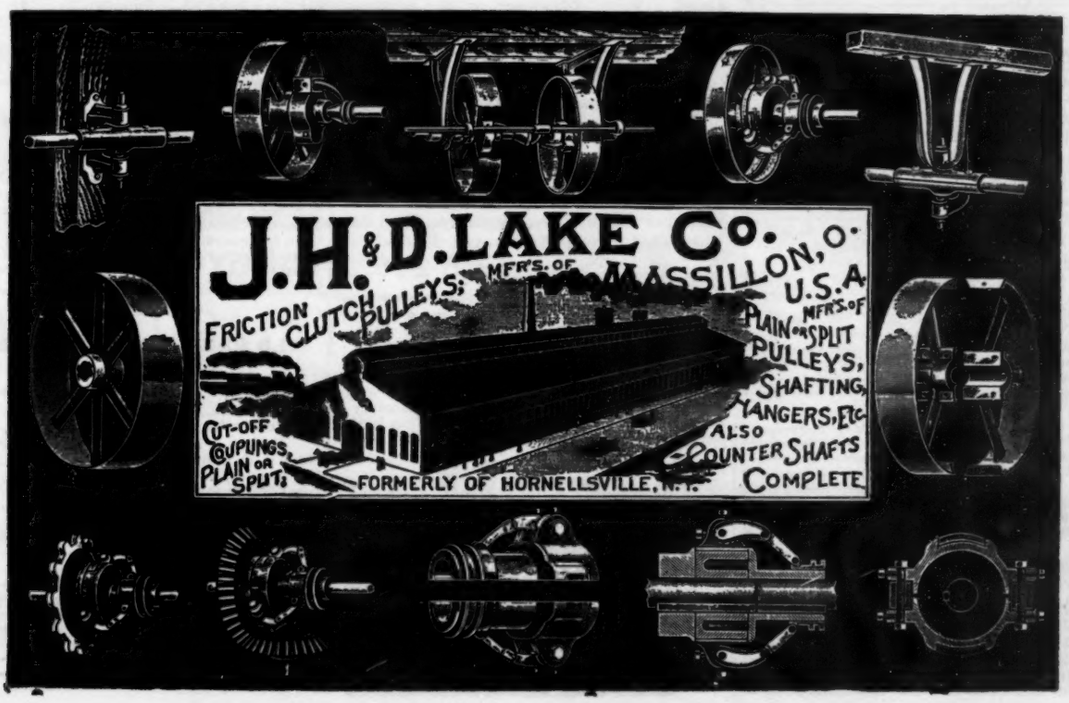
FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8.4c am	* 5.15 pm
Akron, Columbus & Zanesville	†12.45 am	*11.55 pm
Akron and Columbus	* 8.40 pm	*5.15 pm
Akron and Orrville	† 3.25 pm	† 9.50 am
Columbus and Cincinnati	* 8.00 pm	* 7.00 am

Valley Ry.

Depot foot of So. Water St.
City Office 143 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:40 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:40 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Garrett	†3:00 P M	†11:00 A M
Wooster		*6:30 P M
Akron, Canton & Marietta	†3:00 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†3:00 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Compartment Sleeping cars between Cleveland and Chicago.


J.H. & D. LAKE CO.
MFR'S OF
MASSILLON, O. U.S.A.
FRICTION CLUTCH PULLEYS;
MFR'S OF PLAIN OR SPLIT PULLEYS, SHAFTING, HANGERS, ETC.
ALSO COUNTER SHAFTS COMPLETE
CUT-OFF COUPLINGS, PLAIN OR SPLIT;
FORMERLY OF HORNELLSVILLE, N.Y.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
*Acme Safety Emery Wheel Co	—
Adt, John & Son	19
Adams, C. P.	24
Aitchison, Rob't Perforated Metal Co.	23
American Fire Brick & Clay Co.	16
American Mining & Milling Machinery Co.	18
Anderson & Co., Geo. H.	28
Armstrong Bros.	28
Armstrong Mfg. Co., John R.	27
Artificial Gas Engineering Co.	2
Babcock & Wilcox Co.	28
Barnes Co., W. F. & John	19
*Berger Bros.	28
*Berger Mfg. Co.	—
Bertsch & Co.	15
Bickford Drill & Tool Co.	19
Bickford, H.	28
Biedler, Frank R.	25-27
Billings & Spencer Co.	2
Brightman Stoker Co.	17
Bucyrus Steam Shovel & Dredge Co.	18
Buffalo Forge Co.	1
Byers Machine Co., John F.	26
Cady Mfg. Co.	23
Capital Machine Tool Co., The	19
Cary & Moore	2
Chester Steel Casting Co.	24
Cincinnati Milling Machine Co.	1
Cleveland City Forge & Iron Co.	1
Cleveland Rolling Mill Co.	24
Cleveland Twist Drill Co.	28
Cleveland & Buffalo Transit Co.	27
*C. M. & St. P. Ry.	—
Cole, J. Wendell	28
Condit-Fuller Co.	26
Consolidated Roofing Works	28
Correspondence School of Mechanics	25
Dawson & Goodwin	17
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co.	23
Eclipse Electrotype & Engraving Co.	19
Empire Paint & Roofing Co.	24
Excelsior Paint & Roofing Co.	17
Fay & Egan Co., J. A.	23
Fleharty, J. H. & Co.	26
Forster, Hawes & Co.	1
*Freeman & Sons Mfg. Co.	2
Garden City Sand Co.	15
Gerlach, Peter & Co.	26
Greiner Economical Cupola Co.	27
Harrington & King Perforating Co.	26
Hartford Steam Boiler Insp. & Ins. Co.	18
Heflich, S.	25
*Hendrick Mfg. Co., Ltd	22
Hill, Clarke Co.	1
*Hodell, H. H. & Co.	—
Hollis & Emmerton	2
Hunt Co., C. W.	24
Illinois Screw Co.	1
Iron Clad Paint Co.	23
Jeffrey Mfg. Co.	27
Jenks, James	21
Jessop & Sons, Ltd., Wm.	19
Jones, E. H. & Co.	28
King & Andrews Co., The	19
*Laird & Son	—
Lake Co., J. H. & D.	21
*Lake Shore Iron Works	—
Lane & Bodley Co., The	18
Lawrence Scientific School	25
Lloyd Booth Co	26
Long & Allstatter Co.	19
Lyman, W. C.	1
Magnolia Anti-Friction Metal Co.	1
McNeil Co., J. C.	25
Milton Mfg. Co.	28
Murdock, Jr., Jas.	28
Newell Bros.	1
†Oak Hill Fire Brick & Coal Co.	—
Oglebay, Norton & Co.	26
Otto Gas Engine Co.	26
Outhwaite, J. H. & Co.	26
Parker, Richard A.	27
Pemberton, Geo.	27
Pittman, C. K.	2
Pollock, Wm. B. & Co.	2
Pool, F. J. & H. R.	1
Pope, E. C.	26
Prentiss Tool & Supply Co.	19
Quint, A. P.	28
Rainey, W. J.	1
Richards, M. V.	27
*Robertson, W. H.	19
Robertson, R. C.	2
Robinson & Orr	2
Schantz, A. A.	22
†Sharon Fire Brick Works	1
Shiffler Bridge Co.	22
Sibell & Co., Geo. H.	23
Spence & Son, I.	2
Stauffer, J.	24
Stevenson Bros. & Co.	28
Stilwell & Bierce Co.	2
Sykes Iron Roofing Co.	24
Taylor & Boggis Foundry Co.	1
Thurman Fuel Oil Burner Co.	17
Timolat, J. G.	25
*Timmis & Clissold	25
Tod, Wm. & Co.	26
Toledo Machine & Tool Co.	27
*Trenton Iron Co.	—
Union Electrotype Foundry	17
Union Mining Co.	16
Upson Nut Co.	26
Van Duzen Gas Engine Co.	2
Vulcan Iron Works	18
Walburn-Swenson Co.	19
Wells Engine Co.	27
Westmoreland Fire Brick Co.	18
*Williams Bros.	22

RARE CHANCE!

FOR SALE—Stock of Hardware, Stoves and Tinware. Situated within forty miles of Chicago. Population 8,000.

Address **T. R.,**
Care of Iron Trade Review.

PERFORATED SHEET METALS

OF EVERY DESCRIPTION,
FOR SCREENING PURPOSES.

THE HENDRICK MFG. CO., Ltd.,
CARBONDALE, PA.

SPEND YOUR OUTING ON THE GREAT LAKES.

Visit picturesque Mackinac Island. It will only cost you about $12.50 from Detroit; $15 from Toledo; $18 from Cleveland, for the round trip, including meals and berths. Avoid the heat and dust by traveling on the D. & C. floating palaces. The attractions of a trip to the Mackinac region are unsurpassed. The island itself is a grand romantic spot, its climate most invigorating. Two new steel passenger steamers have just been built for the upper lake route, costing $300,000 each. They are equipped with every modern convenience, annunciators, bath-rooms, etc., illuminated throughout by electricity, and are guaranteed to be the grandest, largest and safest steamers on fresh water. These steamers favorably compare with the great ocean liners in construction and speed. Four trips per week between Toledo, Detroit, Alpena, Mackinac, St. Ignace, Petoskey, Chicago, "Soo," Marquette and Duluth. Daily between Cleveland and Detroit. Daily between Cleveland and Put-in-Bay. The cabins, parlors and staterooms of these steamers are designed for the complete entertainment of humanity under home conditions, the palatial equipment, the luxury of the appointments, makes traveling on these steamers thoroughly enjoyable. Send for illustrated descriptive pamphlet. Address A. A. SCHANTZ, G. P. & T. A., D. & C. Detroit, Mich.

FOR SALE!

A new IRON BUILDING for immediate shipment, 81 ft. wide, 200 ft. long, consisting of a main span 61 ft. wide, with lean-to on one side 20 ft. wide. The trusses are sufficiently strong to carry a line of shafting and light jib crane. This building is suitable for a Machine Shop, Tin Plate Mill, Rolling Mill, etc.

For further information, address
SHIFFLER BRIDGE CO., Pittsburg, Pa.

WELL DRILLING MACHINERY.
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N.Y.
MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER.
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 0.00
Hematites No. 1 non-Bessemer	2.25@ 2.50
No 1. Specular, non-Bessemer	2.50@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$13 00@$00 00
No. 1 Strong Foundry	11 25@ 11 50
No. 2 Strong Foundry	10 25@ 10 50
No. 1 Gray Forge, red short	9 50@ 9 75
No. 2 Gray Forge, neutral	9 25@ 00 00
No. 1 American Scotch	11 60@ 00 00
No. 2 American Scotch	10 60@ 00 00
Lake Superior Charcoal	14 00@ 14 50
PITTSBURG:	
No. 1 Foundry	$11 25@$11 50
No. 2 Foundry	10 50@ 11 00
Gray Forge	9 25@ 9 50
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	13 00@ 00 00
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$15 00@$15 50
Local Coke Foundry No. 1	11 25@ 11 50
Local Coke Foundry No. 2	10 25@ 10 50
Local Coke Foundry No. 3	10 00@ 10 25
Local Scotch Foundry No. 1	11 50@ 11 75
Local Scotch Foundry No. 2	10 75@ 11 25
Local Scotch Foundry No. 3	10 25@ 10 75
Southern Coke No. 1	10 75@ 11 00
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 75@ 10 00
Southern No. 1 Soft	10 00@ 10 25
Southern No. 2 Soft	9 75@ 10 00
Southern Silveries No. 1	11 50
Southern Silveries No. 2	11 00
Southern Gray Forge	9 35@ 9 60
Jackson Co. Silveries	14 60@ 15 50
Ohio Silveries No. 1	12 50@ 13 00
Ohio Silveries No. 2	11 75@ 12 00
Ohio Strong Softeners	12 60@ 13 25
Alabama Car Wheel	17 50@ 18 00
Southern Charcoal No. 1	14 50@ 15 00
Southern Charcoal No. 2	14 00@ 14 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 25@$10 50
Southern Coke No. 2 and No. 1 Soft	9 25@ 9 50
Hanging Rock Coke, No 1	12 00@ 12 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	14 50@ 16 00
Southern Coke, Grey Forge	8 75@ 9 00
" " Mottled	8 50@ 8 75
Standard Alabama Car Wheel	16 25@ 17 25
Tennessee " "	15 50@ 16 00
Lake Superior " "	16 00@ 16 50
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$11 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 25
Ohio Softener No. 1	11 75
Jackson Co. Silvery No. 2	15 50@ 16 50
Lake Superior Charcoal	14 75
Tennessee Charcoal	15 50
Southern Soft No. 1	11 00
Southern Soft No. 2	10 00
Alabama Car Wheel	16 00@ 17 05
Hanging Rock Charcoal	18 50
LOUISVILLE (reported by Geo. H. Hull & Co.)	
Southern Coke No. 1 Foundry	$10 25@$10 50
Southern Coke No. 2 Foundry	8 75@ 9 25
Southern Coke No. 3 Foundry	8 50@ 8 75
Gray Forge	8 00@ 8 50
Southern Charcoal No. 1 Foundry	12 50@ 13 50
Car Wheel	15 00@ 15 50
Spathite	11 25@ 11 75
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$10 75@$11 00
Southern Coke No. 2	7 75@ 10 00
Southern Coke No. 3	9 50@ 9 75
Southern Gray Forge	9 00@ 9 25
Southern Charcoal No. 1	15 00@ 16 00
Missouri Charcoal No. 1	12 00@ 12 50
Ohio Softeners	14 50@ 15 00
Lake Superior	16 50@ 17 00
Southern	17 00@ 17 50
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	GROSS TONS
Old iron rails	$12 50
Old steel rails	10 00
	NET TONS
No. 1 R. R. wrought scrap	$ 9 50
No. 1 wrought scrap	9 00
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	6 75
Cast borings	5 00
Uncut wrought iron boilers	3 00
Steel boiler plates	8 00
Grate bars	4 00
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 50

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

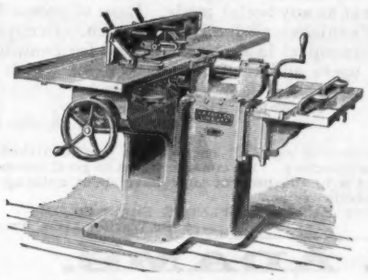
WIRE STRAIGHTENERS AND CUTTERS.
Power Presses, Dies, Drop Hammers, Punches and Shears, Special Machinery, Wire Forming Machines. . . . .

J. A. FAY & CO.

286 to 306 W. Front St.,
CINCINNATI, OHIO,
U. S. A.

WOOD-CUTTING MACHINERY
FOR ANY PURPOSE.

MAKERS, INTRODUCERS AND ORIGINATORS.



NO. 2 VARIETY WOOD-WORKER.

The infinite variety of work performed by this machine has given it the position as the most useful one in existence for the working of wood. It is simply invaluable, for it is capable of almost every operation known to the art.

THE LONG LINE OF AWARDS, FROM 1851 DOWN TO THE "GRAND PRIX" AT PARIS, 1889, HAS BEEN ADDED TO BY THE CAPTURE OF THE "GRAND HONORS" AT THE WORLD'S FAIR, CHICAGO, 1893.

PATTERN AND FLASK MAKING
MACHINERY, ETC., SUPPLIED.

The latest and most advanced ideas for fast, perfect and reliable productions.

PERFORATED METALS
OF ALL KINDS FOR
MILLING MINING AND AGRICULTURAL MACHINERY,
PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON. PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

Horse AND Mule Shoes
SHEETS, BARS, SLABS AND BILLETS.
Light Sheets for TINNING AND PERFORATING a Specialty.
Geo. H. Sibell & Co., 614-218 La Salle St., Chicago.

DIXON'S PERFECT LUBRICATING GRAPHITE.
The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease
NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
An Interesting and Instructive Pamphlet will be sent Free of Charge.
JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.25c@1.35c
Angles	1.15c@1.20c
Tees	1.35c@1.45c
Universal Plates	1.25c
Sheared Plates	1.35c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
1½ to 6 by ⅜ to 1 inch	1 35
1¾ to 6 by 1⅛ to 2 inch	1 50
1¼ & 1¾ by ⅜ to ¾ inch	1 35
1 & 1⅛ by ⅜ to ¾ inch	1 40
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 50

Round and Square.

1 to 1⅞ inch	1 30
2 to 2⅛ inch	1 40
2¼ to 3¼ inch	1 55
3⅜ to 4 inch	1 80
4⅛ to 4⅝ inch	2 40
4¾ to 5 inch	2 60

Oval.

⅜ to 1¼ inch	1 50
⅝ to ¾ inch	1 50
½	1 70
⅞	1 90

Half Oval and Half Round.

1¼ to 3 inch	1 85
⅜ to 1¼ inch	1 65
⅝ to ¾ inch	1 90
½	2 05
⅜	3 15

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 40
1 to 1¾ by ¼ and 5-16 inch	1 45
¾ to ⅞ by ¼ and 5-16 inch	1 55
½ to ⅝ by ¼ and 5-16 inch	1 80

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 85
1 7-16 to 2, No. 17, 18 and 19	1 90
1 7-16 to 2, No. 20	2 00
1 7-16 to 2, No. 21	2 10
1 7-16 to 2, No. 22	2 20
1½ to 1⅜, No. 13, 14 and 15	1 90
1½ to 1⅜, No. 16, 17 and 18	1 95
1½ to 1⅜, No 19 and 20	2 00
1½ to 1⅜, No. 21	2 10
1½ to 1⅜, No. 22	2 20
15-16 and 1 inch, No. 13, 14 and 15	1 85
15-16 and 1 inch, No. 16, 17 and 18	2 00
15-16 and 1 inch, No. 19 and 20	2 10
15-16 and 1 inch, No. 21	2 20
15-16 and 1 inch, No. 22	2 30
⅞, No. 13, 14 and 15	2 10
⅞, No. 16. 17 and 18	2 20
⅞, No. 19 and 20	2 30
⅞, No. 21	2 40
⅞, No. 22	2 50
13-16, No. 13, 14 and 15	2 20
13-16, No. 16, 17 and 18	2 30
13-16, No. 19 and 20	2 40
13-16, No. 21	2 50
13-16, No. 22	2 60
¾, No. 13, 14 and 15	2 30
¾, No. 16, 17 and 18	2 45
¾, No. 19 and 20	2 55
¾, No. 21	2 65
¾, No. 22	2 75
11-16, No. 13, 14 and 15	2 55
11-16, No. 16, 17 and 18	2 60
11-16, No. 19 and 20	2 70
11-16, No. 21	2 80
11-16, No. 22	2 90
11-16, No. 23	3 00
⅝, No. 13, 14 and 15	2 60
⅝, No. 16, 17 and 18	2 70
⅝, No. 19 and 20	2 80
⅝, No. 21	2 90
⅝, No. 22	3 00
⅝, No. 23	3 10
9-16, No. 13, 14 and 15	2 80
9-16, No. 16, 17 and 18	2 90
9-16, No. and 20	3 00
9-16, No. 21	3 10
9-16, No. 22	3 20
9-16. No. 23	3 30
7-16 and ½ inch, No. 13, 14 and 15	3 00
7-16 and ½ inch, No. 16, 17 and 18	3 10
7-16 and ½ inch, No. 19 and 20	3 20
7-16 and ½ inch, No. 21	3 30
7-16 and ½ inch, No. 22	3 40
7-16 and ½ inch, No. 23	3 50
⅜, No. 13, 14 and 15	3 50
⅜, No. 16, 17 and 18	3 60
⅜, No. 19 and 20	3 70
⅜, No. 21	4 00
⅜, No. 22	4 10
⅜, No. 23	4 25

Light Band.

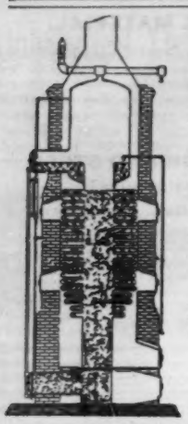
1½ to 6 by ⅛ to 3-16 inch	1 60
1½ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 85
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 95
¾ inch, " " " " 13 and 14	2 1.

Sheet Iron.

No. 10	1 8
No. 12	1 90
No. 14	1 95



THE ADAMS
WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co., }
NILES, O., Aug. 18, 1893. }

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS.
807 The Cuyahoga, - CLEVELAND. O.

CLEVELAND ROLLING MILL CO.,
CLEVELAND, - OHIO,
—MANUFACTURERS OF—
BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

EUREKA FENCE RATCHET.
SIMPLE, STRONG AND CONVENIENT TO HANDLE.

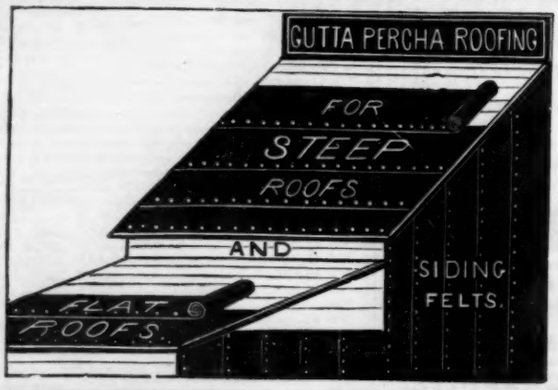
All parts held together by a pin inside of box; no losing of pawls or rollers. It can be adjusted quickly and be bought cheap. Both large and small sizes. Write for prices and terms. Address,

J. STAUFFER, 1630 East 3d St., Dayton, O.

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., - Chicago and Niles, O.



BEST AND CHEAPEST
ROOFING
For Iron Works, Foundries, Mills and Factories.

Elastic Paint for Metal Roofs and Siding only 60c. per gallon in bbls.

Send for Catalogue and references from hundreds of the largest Manufacturing firms in the United States. Also Water Proof Siding and Sheathing Paper.

Empire Paint & Roofing Co.,
111 N. Fourth St.,
PHILADELPHIA, PA.

STEEL CASTINGS
FROM 1 TO 40,000 POUNDS WEIGHT.
Of Open Hearth, Chester or Bessemer Steel.
True to Pattern. Sound. Solid.
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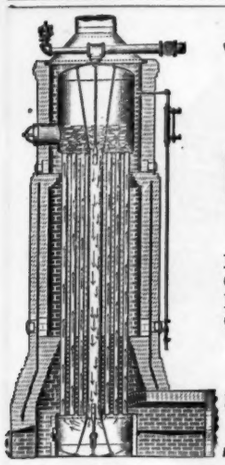

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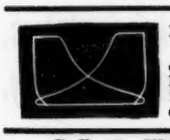

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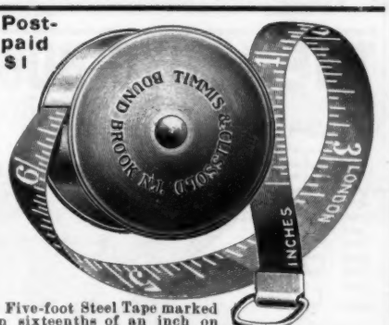

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Western	dis 70
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Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	15c
" " " " over 5 lbs	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¼	3¼
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Washers	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ₱ lb add ½c., 1 lb boxes add 1c to list.

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Brass and Copper	dis 50
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Russia " "	₱ lb 14
Italian " "	₱ lb 13@19
Plumbago Piston	₱ lb 40
Peerless	₱ lb 60
Morrison's "	₱ lb 45
Square Flax "	₱ lb 50
Sheet Rubber	₱ lb 12&24
Excelsior Rubber	₱ lb 48
Rainbow { Full Rolls	45c ₱ lb
Rainbow { Less than Full Rolls	50c ₱ lb
Eclipse Gasket	₱ lb 75

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" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 50
Medart Pulleys	dis 50
Split Wood Pulleys	dis 5c@60

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
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No. 6 "	16c "
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Derfection "	$15 "
Petroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2¼ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

	New List, Jan. 18, 1884
Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

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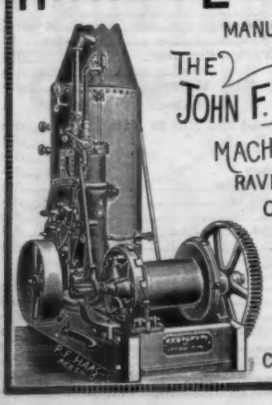

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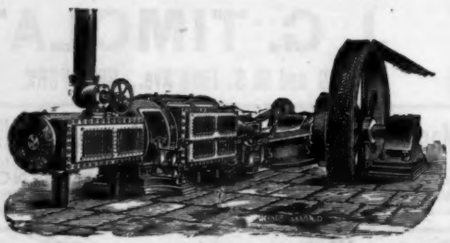

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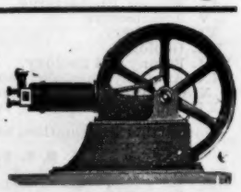

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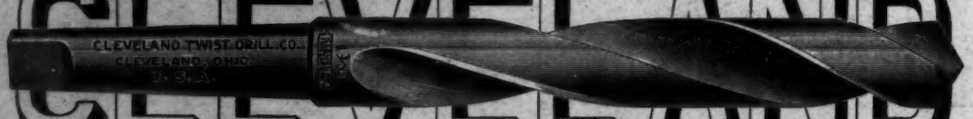

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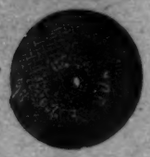

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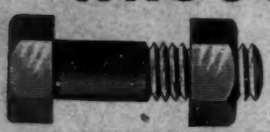

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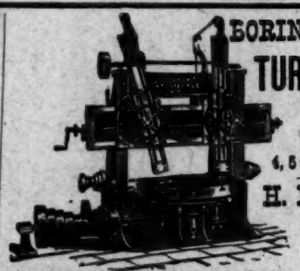

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